DEPARTMENT OF DEFENSE
Systems Engineering

FY 2013 Annual Report

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Stephen P. Welby
Deputy Assistant Secretary of Defense
Systems Engineering

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1 EXECUTIVE SUMMARY

The Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)) provides this report in response to 10 U.S.C. 139b and section 102(b) of Pub. L. No. 111-23, as amended (set out at 10 U.S.C. 2430 note) addressing the systems engineering capabilities of the Department of Defense (DoD) and systems engineering activities relating to the Major Defense Acquisition Programs (MDAP). The Department defines systems engineering (SE) as a methodical and disciplined approach for the specification, design, development, realization, technical management, operation, and retirement of a system. This report includes:

- A discussion of the extent to which the MDAPs are fulfilling the objectives of their Systems Engineering Plans (SEP).

- A discussion of the waivers of and deviations from requirements in SEPs that occurred during the preceding year with respect to such programs; any concerns raised by such waivers or deviations; and the actions that have been taken or are planned to be taken to address such concerns.

- An assessment of the organization and capabilities of the DoD for systems engineering and development planning with respect to such programs.

- Any comments on such report that the Secretary of Defense considers appropriate.

This report presents an overview of the Department's FY 2013 systems engineering efforts in implementing Section 139(b) of the Weapon Systems Acquisition Reform Act (WSARA) as well as an overview of the Department's systems engineering planning and focus areas for FY 2014. The Department remains committed to advancing the practice of systems engineering as a key enabler of successful acquisition throughout the Department.

Section 2 summarizes DASD(SE)'s major activities in the areas of policy and guidance, program engagement and oversight, and systems engineering workforce management, all focused on improving the Department's systems engineering capability.

In FY 2013, DASD(SE) completed a major update to Chapter 4, "Systems Engineering," of the Defense Acquisition Guidebook (DAG), the Department's primary guidance document. This revision expands on the technical activities and expectations associated with the Pre-Materiel Development Decision (MDD) and the Materiel Solution Analysis phases supporting development planning. DASD(SE) also leveraged the Department-wide Development Planning Working Group (DPWG) in FY 2013 to bring together the Warfighter, science and technology, and acquisition communities to develop guidance to reduce the risk associated with introducing new technologies into DoD systems.

DASD(SE) continued efforts to improve reliability and maintainability (R&M) engineering throughout the Department in FY 2013. DASD(SE) developed improved R&M guidance in DAG Chapter 4, enhanced MDAP reliability tracking, and identified competencies and courseware development to enhance R&M workforce capability and capacity.

DASD(SE) continued to work closely with MDAP and Major Automated Information System (MAIS) programs to provide comprehensive systems engineering mentoring and engineering

oversight. DASD(SE) performed structured reviews of formal acquisition documents and conducted technical reviews and assessments for programs in various acquisition life cycle phases.

Section 2 summarizes development planning activities including Analysis of Alternatives (AoA) reviews, mentoring support provided to program offices during SEP and Program Protection Plan (PPP) development, approval of SEPs and PPPs, and input provided for Defense Acquisition Executive Summary (DAES) reporting.

Section 2 also discusses DASD(SE) responsibilities and activities in support of the acquisition engineering workforce. This includes an overview of the recent Defense Acquisition Workforce Improvement Act (DAWIA) career field designation change from Systems Planning, Research, Development, and Engineering (SPRDE) to Engineering and DASD(SE) support for competency model development, Defense Acquisition University (DAU) curriculum revisions, and development of the Key Leadership Position (KLP) initiative.

Section 3 assesses the Military Departments' systems engineering self-assessments, provided in their entirety in appendices A through C. The report highlights the progress of the Military Departments in aligning their organizations to better enable effective Technical Authority and technical execution. Each Military Department has outlined its approach to implementing key provisions of the WSARA, including development planning and early systems engineering, R&M, and systems engineering support to the Joint Capabilities Integration and Development System (JCIDS) and contracting.

The Military Departments, in partnership with DASD(SE), continue to make workforce development a priority for effective systems engineering through a diverse set of initiatives designed to attract and retain a qualified systems engineering workforce and to support the continued implementation of KLP legislation and policy. The Military Departments' current systems engineering workforce projections remain steady, with little growth expected through FY 2018. DASD(SE) continues to ensure that certification standards meet the Department's needs and that the standards are refreshed to meet emerging demands.

Section 4 contains assessments of 42 MDAPs, MAIS programs, and special interest programs that were the focus of significant DASD(SE) activity in FY 2013. The assessments provide a brief status of program SEPs, PPPs, requirements, and measurable performance criteria. The assessments also summarize DASD(SE) involvement in program reviews.

DASD(SE) continues to mature systems engineering and development planning policy, guidance, and performance measures by assessing the effectiveness of systems engineering as executed across the defense acquisition system. The Military Departments' FY 2013 achievements and FY 2014 plans captured in this report support WSARA provisions focused on improving DoD systems engineering. The Department remains committed to sustaining the progress made to date in growing the Department's systems engineering capability.

2 DASD(SE) ACTIVITIES

In FY 2013, DASD(SE) developed DoD systems engineering policy and guidance, provided systems engineering support to MDAP and MAIS programs, and continued efforts to grow and strengthen the defense systems engineering workforce.

As required by DoD Instruction (DoDI) 5134.16, "Deputy Assistant Secretary of Defense for Systems Engineering," DASD(SE) hosts the DoD Systems Engineering Forum, bringing together systems engineering representatives from DoD and other federal agencies responsible for developing complex systems. These forums serve as a mechanism to coordinate systems engineering efforts across the Government and support the exchange of lessons learned and best practices. Participants in FY 2013 included representatives from the Office of the Secretary of Defense (OSD), DoD Components, the Department of Homeland Security, Federal Aviation Administration, NASA, and the National Oceanic and Atmospheric Administration. In FY 2013, DASD(SE) held four forums with emphasis on program protection, metrics, workforce development, and software.

2.1 Policy and Guidance

DASD(SE) oversees the implementation of existing policy and develops new policy and guidance to improve systems engineering practice across the Department. In FY 2013, DASD(SE) released a major update to the DAG Chapter 4 on Systems Engineering. DASD(SE) also supported implementation of new and existing policy and guidance on development planning, R&M, counterfeit prevention, value engineering, open systems architecture, system security engineering, and systems engineering-related standards.

2.1.1 Development Planning

Development planning, or early systems engineering, is intended to enable the Milestone Decision Authority to make informed decisions using sound technical data at the earliest stages of an acquisition program. The updated DAG Chapter 4 expands on the technical activities and expectations associated with Pre-MDD and the Materiel Solution Analysis phase. In addition, DASD(SE) continued the Department-wide DPWG. The working group studied the interactions among the Warfighter, science and technology (S&T), and acquisition communities to develop guidance to reduce risk and better synchronize new technologies and capabilities in the early phases of acquisition programs. The working group continues to serve as a forum for sharing development planning information.

2.1.2 Reliability and Maintainability Engineering

In FY 2013, DASD(SE) implemented several efforts to improve reliability analysis, planning, tracking, and reporting by aligning reliability planning methods and reporting requirements with major acquisition activities.

- DASD(SE) worked with the OSD office of Acquisition Resources and Analysis to implement a process for tracking MDAP reliability status and reporting the status in support of DAES reviews (see 2.2.6). MDAPs in system-level developmental testing with a documented reliability growth curve in the SEP will be required to report reliability data on a quarterly basis. The data will inform the DAES selection process and allow OSD and DoD Components to review MDAP reliability performance to plan and support reliability growth planning for future programs. MDAPs that meet the criteria for reporting will submit their reliability data starting in FY 2014.

- To provide guidance for the systems engineering practitioner on the R&M engineering activities, DASD(SE) revised the R&M section in the DAG. The revised section describes the purpose of R&M engineering as well as its impacts on the system's performance, availability, logistics supportability, and total ownership cost. The revised section includes a table that describes key R&M engineering activities aligned to each acquisition life cycle phase.

- To strengthen the R&M engineering capacity and capability in the acquisition workforce, DASD(SE), in collaboration with DAU and Military Department R&M leadership, continued to develop an R&M human capital strategy. As part of the strategy, DASD(SE) updated the definitions of the R&M engineering competencies in support of an ongoing systems engineering competency review. DASD(SE) also determined the need to develop additional courseware in the area of R&M engineering to address the competencies. The funding for the courseware development was approved, and course development is expected to begin in FY 2014 with a completion date in FY 2015. DASD(SE) is working to create an R&M learning architecture that specifies the training, R&M experience, and DAWIA certifications that R&M engineers require in order to execute R&M activities during different phases of the acquisition life cycle. The learning architecture will support assessment of current R&M engineering capability and will support planning for the future workforce needs.

2.1.3   Systems Engineering in Joint Capabilities Integration and Development System

DASD(SE) seeks early engagement with the requirements community through JCIDS. In FY 2013, DASD(SE) continued its engagement with the Joint Staff's Force Structure, Resources, and Assessment Directorate, J8, to promote greater awareness of systems engineering principles during requirements development.

Since the issuance of the Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01H, "Joint Capabilities Integration and Development System," in January 2012, DASD(SE) has worked with the Joint Staff on the companion "Manual for the Operation of the Joint Capabilities Integration and Development System." In particular, DASD(SE) influenced the format and content of the draft Capability Development Document (CDD). A draft CDD is required to adequately inform the plans and the request for proposals (RFP) for the Technology Development (TD) phase following the Milestone A decision. Systems engineering activities influence the draft CDD by providing a disciplined approach to analyzing alternative solutions, balancing technical risks, and determining achievable Key Performance Parameters (KPP). DASD(SE)'s activity to review specific Initial Capabilities Documents (ICD) and provide feedback to the Joint Staff is discussed in Section 2.2.1. DASD(SE) participation in these reviews provides another opportunity for early systems engineering engagement with the Joint Staff as it defines the Department's requisite capabilities.

2.1.4 Defense Acquisition Guidebook Chapter 4

On May 8, 2013, DASD(SE) published the revised DAG Chapter 4 on Systems Engineering, the Department's primary systems engineering guidance for program managers and systems engineering practitioners. The revised chapter reflects current policy and initiatives and emphasizes the role of systems engineering in providing balanced solutions to deliver capability to the Warfighter while managing cost, schedule, and risk.

The revised chapter includes expectations for acquisition life cycle phase and technical review activities. The associated processes support program success by systematically increasing maturity and reducing risk over the acquisition life cycle. The chapter provides a technical description of major defense acquisition milestones, decision points, technical reviews, and audits and includes details on systems engineering technical and technical management processes with links to relevant policy, standards, and guidance. The description is within the context of the key role systems engineering plays in increasing solution maturity and reducing risk to deliver a capability. The revised chapter covers several new topics, including the systems engineering role in contracting, sustainability analysis, and design considerations to address anti-counterfeiting; intelligence; operational energy; producibility; and packaging, handling, storage, and transportation. The revised DAG also incorporates support for Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) Better Buying Power initiatives. The revised DAG Chapter 4 can be found at https://acc.dau.mil/dag4.

2.1.5 Additional Engineering Policy and Guidance

In response to recent legislative direction, Better Buying Power initiatives, gaps in policy or guidance, and new risk areas, DASD(SE) continued to lead and support the generation of policy and guidance in counterfeit prevention, value engineering, open systems architecture, system security engineering, and systems engineering-related standards.

Counterfeit Prevention. DASD(SE) was a primary contributor to DoDI 4140.67, "DoD Counterfeit Prevention Policy," approved on April 26, 2013. This instruction (1) establishes policy and assigns responsibilities necessary to prevent the introduction of counterfeit materiel at any level of the DoD supply chain; (2) provides direction for anti-counterfeit measures for DoD weapon and information systems acquisition and sustainment to prevent the introduction of counterfeit materiel; and (3) assigns responsibilities for prevention, detection, remediation, investigation, and restitution to defend the DoD against counterfeit materiel that poses a threat to personnel safety and mission assurance. The instruction applies across all phases of materiel management, from identifying and defining an operational requirement to introducing the item into the DoD supply chain to final retirement and disposition. Through this new instruction, the Components are directed to employ a risk-based approach to reduce the frequency and impact of counterfeit materiel within DoD acquisition systems and DoD life cycle sustainment processes.

Value Engineering. DASD(SE) developed DoDI 4245.14, "DoD Value Engineering (VE) Program," released on October 26, 2012. This instruction directs DoD Components to implement a VE program to improve military worth or reduce acquisition and ownership costs wherever it is advantageous to do so. A VE program consists of two parts: a Government-only program that uses

VE Proposals (VEP) to implement changes, and a contracting mechanism by which contractors use VE Change Proposals (VECP) to implement Government-approved changes. A Government-only VEP is used to eliminate unnecessary costs and improve value in the development, procurement, acquisition, and life cycle support of services, materiel, and facilities. It also includes applying VE principles and methodology to the acquisition and Operations and Support (O&S) functions of DoD services, materiel, and facilities. VE provisions are included in contracts when the contract amount is expected to exceed the simplified acquisition threshold. In May 2013, USD(AT&L) announced the winners of the FY 2012 Department of Defense Value Engineering Achievement Awards. The 31 winners produced $5.5 billion in actual savings and cost avoidance using DoD-executed in-house VEPs and approved contractor-initiated VECPs.

Open Systems Architecture. DASD(SE) and the Navy co-chaired the DoD Open Systems Architecture and Data Rights (OSA-DR) Team, which released the DoD Open Systems Architecture Contract Guidebook for Program Managers Version 1.1 in June 2013. This guidebook provides contract language that program managers can use and contains checklists to assist program managers to better understand the business and technical aspects of open systems architecture. This document also helps program managers identify and obtain suitable technical data and computer software deliverables, along with the rights sufficient for competitive use of that data and software.

In addition, the OSA-DR Team published a brochure, "Better Buying Power–Understanding and Leveraging Data Rights in DoD Acquisitions." The brochure will assist contracting officers, program office staff, program executive officer staff, and others making decisions regarding contracting for intellectual property rights as well as engineers who use data rights in development. The brochure describes the uses and context for all rights categories that can be put on contract.

System Security Engineering. DASD(SE) led efforts to mature DoD's acquisition policy on program protection planning, which is composed of a set of policies to ensure protection of DoD systems technology, mission-critical functions and components, and information. On November 5, 2012, USD(AT&L) and DoD Chief Information Officer (CIO) released DoDI 5200.44, "Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)." DASD(SE) then began an update to policy regarding technology protection. DASD(SE) co-led a working group with USD(I) to revise DoDI 5200.39, "Critical Program Information (CPI) Identification and Protection Within Research, Development, and Acquisition (RDA) Programs." This instruction, in formal coordination as of November 2013, requires that programs maintain U.S. Warfighter technical advantage and preserve operational effectiveness of DoD capabilities by identifying and protecting CPI.

To support the exportability goals outlined in USD(AT&L)'s Better Buying Power version 2.0, DASD(SE) revitalized efforts to enhance the DoD Anti-Tamper program and supported the OUSD(AT&L)/International Cooperation (IC) directorate's execution of the Defense Exportability Features (DEF) program. In addition, DASD(SE), in coordination with OUSD(AT&L)/IC and DoD CIO, completed a comprehensive study of the DoD Anti-Tamper program and developed a draft DoD directive for anti-tamper.

DASD(SE) led efforts to improve the protection of DoD technical information in acquisition. DASD(SE) was primarily responsible for the USD(AT&L)-directed Data Vulnerability Tiger Team, a coordinated DoD effort to review progress in protecting unclassified technical information and to identify further action that may be taken to safeguard sensitive technical data across the weapon

system life cycle. In response to the Tiger Team findings, DASD(SE) recommended actions to the USD(AT&L) and the Secretary of Defense that resulted in the release of the October 10, 2013, Secretary of Defense memorandum "Safeguarding Unclassified Controlled Technical Information." This memo directed actions to protect DoD unclassified controlled technical information from cyber intrusions and to minimize the consequences associated with any loss of this information.

Systems Engineering-Related Standards. As the Defense Standardization Executive, in FY 2013 DASD(SE) supported the development of four defense-focused, non-government standards as companions to existing industry standards. DoD is working with the Institute of Electrical and Electronics Engineers (IEEE) and SAE International to develop DoD standards on systems engineering, technical reviews and audits, manufacturing management, and configuration management. DASD(SE) initiated these efforts in response to Component feedback and gap analyses identifying the need for standardization in these areas. The standards will comply with current policy and statute and will be structured for use in defense contracts. Adoption of these standards will provide opportunities for close coordination across Military Departments and with the defense industrial base and will create potential opportunities for cost savings.

2.2   Program Engagement and Oversight

DASD(SE) provides systems engineering oversight for MDAPs and MAIS programs throughout all phases of the acquisition life cycle. The program managers' foundational documents to plan systems engineering, design, development, production, protection, and requirements verification efforts include requirements documents, the SEP, and the PPP. DASD(SE) reviews and comments on requirements documents and works with programs to document their technical planning in both SEPs and PPPs. DASD(SE) is the final approval authority for SEPs for MDAPs and MAIS programs.

Before Milestone A, DASD(SE) participates in development planning activities including reviewing the ICD and the AoA Study Plan, and participates in AoA Senior Advisory Group (SAG) meetings. Throughout all phases, DASD(SE) participates in Integrating Integrated Product Teams (IIPT), Systems Engineering Working Integrated Product Teams (SE WIPT), Systems Engineering Technical Reviews (SETR), and other program technical engagements such as Program Management Reviews.

DASD(SE) developed the Defense Acquisition Program Support (DAPS) methodology to assess program planning and execution during technical reviews. DASD(SE)'s independent systems engineering assessments and recommendations throughout the program life cycle provide information on potential program risks and issues as well as recommendations for leadership to consider during OSD reviews and Overarching Integrated Product Team (OIPT) meetings, which in turn inform the Defense Acquisition Board (DAB) and Milestone Decision Authority. DASD(SE) documents non-attributed results from reviews in a systemic root cause analysis (SRCA) database to analyze patterns and root causes of issues that occur across DoD programs. The data inform subsequent analyses and future policy and guidance as appropriate.

Figure 2-1 shows DASD(SE) FY 2013 program engagement by acquisition phase. Table 2-1 lists the number of engagements by category and program for the programs highlighted in Section 4, and a summary entry for all other program engagement.

Materiel Solution Analysis | Technology Development | PDR | CDR | Engineering and Manufacturing Development | Production and Deployment

Phase markers: MDD | MS A | MS B | MS C | FRP

MDD DAB
EPAWSS
GBSD
ITEP
MNVR
PSCS
WSF

OIPT Support
GBSD
LRPF
MNVR
PSCS

AoA
AAS
EPAWSS
GCV
HTM
ITEP
LRSO
LX(R)
PSCS
UCLASS
WSF

MS A DAB
NGJ

MS A OIPT
IFPC
NGJ
T-AO(X)

PSRs (MSA Phase)
ACV
P-8A Inc 3

SEP (MSA Phase)
NGJ
T-AO(X)

PPP (MSA Phase)
NGJ

Peer Reviews
P-8A Inc 3

PSRs (TD Phase)
3DELRR
AMDR
B-2 DMS
B61
CRH
GCV
MGUE

SEP (TD Phase)
AMDR
AOC-WS
LMP
Space Fence
VXX

PPP (TD Phase)
AMDR
F-22A 3.2B
Space Fence

SFR/SRR
AB3
ACV
AMDR
B61 TKA
Biometrics
Bradley ECP
EPS
FAB-T
IPSAN Inc 4
JMS
P-8A Inc 3
ULCASS
VXX

CCR
AOC-WS

MS B/EMD DAB
AMDR
AMPV
AOC-WS
B-2 DMS
B61 TKA
F-22 3.2B
GPS OCX
IPPS-AF
JMS Inc 2
LMP
Space Fence
VXX

MS B/EMD OIPT
3DELRR
AMDR
AMPV
AOC-WS
B-2 DMS
B61 TKA
F-22 3.2B
IPPS-AF
JMS Inc 2
LMP
VXX

PDR Assessment
3DELRR
AOC-WS
JMS

Focused Reviews
AOC-WS
B61
F-35

Peer Reviews
AMPV
VXX

PSRs (EMD Phase)
GPS OCX
PIM
PAC-3/MSE
SDB II

SEP (EMD Phase)
EELV
Excalibur
JMS
NGEN

PPP (EMD Phase)
CANES
EELV
JMS
NGEN
PIM
SBIRS Geo 5/6

MS C DAB
CANES
EELV
JMS Inc 1
NGEN

MS C OIPT
CANES
JMS Inc 1
NGEN
PIM

CDR Assessment
GMLRS
JLTV
KC-46A

Focused Reviews
CANES
NGEN

Peer Reviews
CANES

PRR
Excalibur1b
F-35
P-8A Inc 1
PIM
SM-6

PSRs (PD Phase)
GPS Ent
GPS IIA

CCR
GCSS-MC

SEP (PD Phase)
ISPAN Inc 2
MUOS

PPP (PD Phase)
DCGS-A
E-2D AHE
GCSS-A
KMI
MIDS
MQ-1C
MQ-9
WIN-T Inc 2

FRP/FDD DAB
DCGS-A
E-2D
GCSS-A
KMI
MQ-1C
SM-6
WIN-T Inc 2

FRP OIPT
DCGS-A
E-2D
GCSS-A
KMI
MQ-1C
SM-6
WIN-T Inc 2

Focused Reviews
EMARSS
JTRS NED
KMI
MQ-1C
SM-6

Peer Review
HMS

IPR DAB
EPS
JHSV
JLENS
LCS MM
LC SF
MQ-4C
MUOS
P-8A Inc 1
PAR
T-AO(X)
WSF

IPR OIPT
ACWA SGB
AF Logistics
DAI
DEAMS
F-35
GCSS-MC (CCR)
GPS AGER
IPPS-A
ISPAN Inc 4 (QPR)
JLENS
LCS SF
P-8A Inc 1
PAR
PKI (CCR)
RQ4-A/B Global Hawk
SDB II
WSF

Figure 2-1. FY 2013 DASD(SE) Program Engagement by Acquisition Phase

Table 2-1. FY 2013 DASD(SE) Program Engagement by Category

Program Name (Acronym)	SE Activities			Technical Review and Assessments												DASD(SE) Support to OSD Reviews		
	WIPT	SEP	PPP	PSR	Focused Review	NM/CCR	RFP Peer Review	Subsys PDR	Sys PDR	PDR Asmt	Subsys CDR	Sys CDR	CDR Asmt	DAES	Other SETRs	AoA SAG	OIPT	DAB/ITAB
3DELRR				1					3	3					3		1	
AMDR		1	1	1											2		1	1
AOC-WS	1	1			1	1			1	1							1	1
B-2 DMS-M	1			1				1							1		1	1
B61 TKA				1	1									✓	2		1	1
CANES			1		1		1							✓			1	1
CH-53K	2													✓	2			
CIRCM	2								2									
CRH	1			1														
DCGS-A			1											✓			1	1
E-2D AHE			1											✓				1
EPS								1	1		1				1		1	1
F-22A 3.2B		1									1				4		1	1
F-35 JSF					1				1		8			✓	14		1	
GCSS-MC						1								✓	1		1	
GCV	2			1					2	1					11	2		
GMLRS											2	1	1	✓	3		1	
GPS Ent				4					1		2			✓	1		2	1
ITEP																2		1
JLTV	3											4	3	✓	7			
JMS		1	1						1	1					1		2	2
KC-46A											8	1	1	✓				
KMI	3		1		1									✓	2		1	3
LCS MM	4													✓	1		1	1
LCS SF	3													✓	1		1	1
MQ-1C	3		1		1									✓			1	1
MQ-4C	2													✓	3			1
MUOS		1												✓	3			1
NGEN	3	1	1		1										2		1	1
NGJ	2	1	1												4		1	1
OR	1														1			

Program Name (Acronym)	SE Activities			Technical Review and Assessments												DASD(SE) Support to OSD Reviews		
	WIPT	SEP	PPP	PSR	Focused Review	NM/CCR	RFP Peer Review	Subsys PDR	Sys PDR	PDR Asmt	Subsys CDR	Sys CDR	CDR Asmt	DAES	Other SETRs	AoA SAG	OIPT	DAB/ITAB
P-8A	4			1			1							✓	4		1	1
PIM			1	1										✓	5		1	
RMS	6													✓	2			
SDB II				1										✓			1	
SM-6					1									✓	1		1	1
SSC	1							2						✓	1			
SSN 774														✓				
T-AO(X)	1	1															1	1
UCLASS															2	1		
VXX	3	1					1		1						1		1	1
WIN-T Inc 2	4		1								1			✓			1	1
Other Programs	33	5	6	2	2		2		5	1	7				33	21	24	15
Total	**85**	**13**	**18**	**15**	**10**	**2**	**5**	**14**	**10**	**5**	**30**	**6**	**5**		**119**	**26**	**53**	**43**

WIPT – Working Integrated Product Team

SEP – Systems Engineering Plan

PPP – Program Protection Plan

PSR – Program Support Review

NM/CCR – Nunn-McCurdy / Critical Change Review Certification

Subsys PDR – Subsystem-level Preliminary Design Review

Sys PDR – System-level Preliminary Design Review

PDR Asmt – Preliminary Design Review Assessment complete

Subsys CDR – Subsystem-level Critical Design Review

Sys CDR Sys – System-level Critical Design Review

CDR Asmt – Critical Design Review Assessment complete

DAES – Defense Acquisition Executive Summary Assessments for Program Schedule, System Performance, Management, Interoperability Information Security, and Production (✓ Required to submit DAES assessments)

Other SETRs – Other Systems Engineering Technical Reviews, such as System Requirements Review (SRR), System Functional Review (SFR), Technical Information Meeting (TIM)

AoA SAG – Analysis of Alternatives Senior Advisory Group review meeting

OIPT – Overarching Integrated Product Team

DAB/ITAB – Defense Acquisition Board/ Information Technology Acquisition Board

Other Programs – Programs other than those featured in Section 4.

2.2.1 Development Planning

Development planning advances informed decision making by the Milestone Decision Authority. It also promotes a clear mutual understanding of a needed capability between the user and the acquisition office. During development planning, DASD(SE) evaluates areas such as schedule feasibility, funding, interdependency, metrics, planning, and staffing. In FY 2013, DASD(SE) development planning activities included participating in SE WIPTs, IIPTs, and OIPTs; reviewing ICDs and commenting on AoA study guidance and plans in advance of the MDD; and participating in AoA activities and reviewing draft CDDs in support of Milestone A. These early, foundational activities and documents are critical because they shape a program's technical planning for the Milestone A phase and beyond.

DASD(SE) reviewed 13 draft ICDs to assess whether the programs understood and had clearly defined the capability gaps in their Concept of Operations. DASD(SE) reviewed the ICDs to ensure the capabilities were defined with metrics and minimum values and defined so as not to prejudice a particular materiel solution. DASD(SE) identified issues on four of the 13 ICDs. Issues included ICD recommendations that were out of scope with technology development or the anticipated budget, and program development candidates that were inconsistent with the Military Departments' long-term plans.

DASD(SE) participated in 26 AoA events on 10 programs to assess the technical feasibility of alternatives to resolve the user's mission needs. DASD(SE) reviewed AoA guidance and AoA Study Plans to ensure the materials adequately addressed systems engineering interests such as the Integrated Master Schedule, risk management, R&M, and system integration. DASD(SE) identified issues on the majority of the AoA study guidance documents, typically in the areas of system integration complexity, performance impacts and trade space, and risk assessment.

DASD(SE) participated in six program MDDs. In the months leading up to the MDD, DASD(SE) supported program preparation for the milestone, including providing guidance on which milestone the program should enter the acquisition process. During the period following the MDD, DASD(SE) reviewed the technical planning and management approaches documented in the program's pre-Milestone A SEP. During this phase, a program identifies KPPs or other performance attributes to support the development of a system specification. In addition, the program identifies trade space in which to arrive at a realistic program solution. In reviewing SEPs, DASD(SE) frequently commented on areas such as technical performance parameters, schedule adequacy, risk management, and the details of planned technical reviews. DASD(SE) also reviewed and informed the development of program Technology Development and Acquisition Strategies.

DASD(SE) reviewed and commented on 18 draft CDDs. DASD(SE) assessed the CDDs for stable and measurable requirements that are technically achievable within the established schedule and budget. DASD(SE) also reviewed to ensure the requirements were informed by sound systems engineering trade-off analysis conducted during the AoA and TD phase activities.

Table 2-2 summarizes the number of programs with which DASD(SE) engaged in development planning during FY 2013.

Table 2-2. FY 2013 Development Planning (Early Systems Engineering)

ICDs Reviewed	AoA Engagement	MDDs	CDDs Reviewed
13	10	6	18

2.2.2 Systems Engineering Plan

The SEP is the program's functional technical planning document. It describes the program's overall technical approach, including key technical risks, processes, resources, organization, metrics, and design considerations. DASD(SE) reviews draft SEPs and approves final SEPs for MDAPs and MAIS programs at Milestones A, B, and C. The SEP evolves with the program to identify the program's major systems engineering activities, processes, resources, metrics, products, risks, and event-driven schedules. DASD(SE) provides assistance to programs as they develop the SEP and participates in Program Management Office (PMO)-organized SE WIPTs to help shape and mature the document.

DASD(SE) engages with PMOs approximately 6 to 12 months before a program milestone review to support SEP development. Typically, SEPs that are developed and reviewed in one fiscal year are approved in a following year. After approving a program SEP, DASD(SE) tracks performance to plan in order to assess design maturation, provide early warning of risks, and inform mitigation activities.

Table 2-3 summarizes the DASD(SE) FY 2013 SEP-related review and approval activities. In FY 2013, DASD(SE) reviewed 36 program SEPs and approved 13.

Table 2-3. FY 2013 SEP Review and Approval Activity

Major Programs	Program SEPs Reviewed			Program SEPs Approved		
	MDAP	MAIS	Total	MDAP	MAIS	Total
Supporting MS A	5	0	**5**	2	0	**2**
Supporting MS B	8	7	**15**	3	2	**5**
Supporting MS C	7	3	**10**	1	2	**3**
Other (FDD, FRP, ADM Action, etc.)	5	1	**6**	2	1	**3**
Total	25	11	**36**	8	5	**13**

DASD(SE) endorses early and frequent engagement with PMOs to facilitate SEP development. Programs that do not engage early with DASD(SE) are more likely not to have an approved SEP by the target milestone review. In FY 2013, 5 of the 14 SEPs submitted for approval were submitted late by the Military Departments and were not approved before the milestone review as required by policy. One of the late submissions was disapproved and will be updated and resubmitted for approval in FY 2014.

DASD(SE) provided the Military Departments with SEP training through widely attended events such as the Army Systems Engineering Forum (ASEF) and Space and Missile Command (SMC) annual SEP days. DASD(SE) also receives individual requests from non-MDAP and lower-level Acquisition Category (ACAT) PMOs for guidance in developing SEPs and for insight regarding systems engineering best practices.

2.2.3   Program Protection Plan

The PPP is the program's integrated system security engineering document. It describes the program's critical program information and mission-critical functions and components, threats to and vulnerabilities of these items, the plan to apply countermeasures to mitigate associated risks, and planning for exportability and potential foreign involvement. The PPP emphasizes full life cycle planning and execution of all security activities in an acquisition program.

DASD(SE) leads review of draft PPPs for ACAT ID and IAM programs at Milestones A, B, and C. Whereas DASD(SE) approves the SEP, the USD(AT&L) approves the PPP. The PPP evolves with the program's identification of the critical program information, mission-critical functions and components, associated threats and vulnerabilities, potential foreign involvement, countermeasures, and risks.

DASD(SE) provides assistance to programs as they develop the PPP and participates in PMO-organized Integrated Product Teams (IPT) to help shape and mature selection of the countermeasures. DASD(SE) endorses early and frequent engagement with PMOs to facilitate PPP development. Programs that do not engage early with DASD(SE) are more likely not to have an approved PPP by the target milestone review. As with the SEP, the PPPs may begin development in one year and be approved in the next. In FY 2013, DASD(SE) reviewed and supported the development of 18 PPPs. The USD(AT&L) approved 18 PPPs.

DASD(SE) received requests to provide PPP training at Eglin Air Force Base and Gunter Air Force Base. DASD(SE) also receives individual requests from non-MDAP and lower-level ACAT PMOs for guidance in developing PPPs and for insight regarding program protection planning best practices.

2.2.4   Systems Engineering Assessments

DASD(SE) provides a range of systems engineering assessments on programs, including PSRs, SETRs, and Focused Reviews, to assess program planning and execution on behalf of USD(AT&L). DASD(SE) uses its DAPS methodology (see 2.2.4.1) to conduct the assessments, which are intended to assist the PMO to assess program health, identify risks, and consider corrections to keep the program on track in terms of schedule, performance, and cost. DASD(SE) reviews major programs before and in support of an OIPT or DAB review. DASD(SE) also assesses MDAP and MAIS programs in support of monthly and quarterly DAES reporting (see 2.2.6).

DASD(SE) conducted the following types of systems engineering assessments in FY 2013:

1. Program Support Reviews (PSR) – DASD(SE) leads PSRs on ACAT ID and ACAT IAM programs. DASD(SE)-led teams, including support from other OSD organizations, meet with the program office and, as appropriate, the prime contractor's engineering staffs. PSRs address either the program's technical planning and management approaches or the program's progress demonstrated during an acquisition phase and plans to mitigate technical risks and issues. PSRs inform OIPT and DAB leadership decisions. The reviews are conducted in advance of acquisition milestones to inform program planning and resolve issues before a milestone decision. When possible, reviews are conducted in conjunction with Military Department-level reviews. DASD(SE) conducted 15 PSRs in FY 2013.

2. Systems Engineering Technical Reviews (SETR) – SETRs are reviews the program leads as part of its technical execution. DASD(SE) participates in MDAP and MAIS Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR) and conducts assessments of the reviews, which are formally reported to the USD(AT&L). The PDR and CDR assessments provide an independent appraisal of the quality and completeness of the program's system-level PDRs and CDRs. In the case of the PDR, the DASD(SE) assessment informs the Milestone Decision Authority's 10 U.S.C. 2366b certification activities. DASD(SE) participates in other SETRs across the program life cycle, such as Systems Requirements Reviews, System Functional Reviews, Systems Verification Reviews, Functional Configuration Audits, Production Readiness Reviews, Test Readiness Reviews, and technical In-Process Reviews. In FY 2013, DASD(SE) completed 5 PDR assessments and 5 CDR assessments. In all, DASD(SE) participated in 119 SETRs for 43 programs.

3. Nunn-McCurdy Certification Reviews and Critical Change Reviews (CCR) – DASD(SE) typically assesses program management, risk management, and systems engineering processes to support the USD(AT&L) in certifying that the management structure of the program is adequate to manage and control costs. As with PSRs, DASD(SE) uses the DAPS methodology for Nunn-McCurdy certification reviews and CCRs. DASD(SE) supported no Nunn-McCurdy reviews and two CCRs in FY 2013.

4. Focused Reviews – Focused Reviews typically are requested by the Service, program, or OSD leadership. In FY 2013, areas assessed in these Focused Reviews included reliability, software, manufacturing, and schedule. DASD(SE) conducted 10 Focused Reviews in FY 2013.

5. Request for Proposal (RFP) Peer Reviews – DASD(SE) supports the Director, Defense Procurement and Acquisition Policy as a team member during pre-award Peer Reviews for service contracts with an estimated value of $1B or more. Pre-award Peer Reviews are conducted in three phases: (1) prior to issuance of the solicitation; (2) prior to request for final proposal revisions; and (3) prior to contract award. DASD(SE) supported five RFP Peer Reviews in FY 2013 to ensure systems engineering rigor and equities were properly reflected in the proposals.

Table 2-4 indicates the number of major systems engineering assessments DASD(SE) performed in support of MDAPs and MAIS programs in FY 2013.

Table 2-4. FY 2013 DASD(SE) Systems Engineering Assessment Summary

Major Program	PSRs	NM/CCR	Focused Reviews	PDR Assessment	CDR Assessment	DPAP RFP Peer Reviews
MDAP/Pre-MDAP	15		6	3	5	4
MAIS/MDA		2	4	2		1
Total	**15**	**2**	**10**	**5**	**5**	**5**

Figure 2-2 shows the number of assessments DASD(SE) completed in FY 2013 by domain area and Military Department. Figure 2-3 shows the number by acquisition phase.

Fiscal Year 2013
- **Program Support Reviews: 15**
- **Focused Reviews: 10**
- **PDR/CDR Assessments: 10**
- **CCRs: 2**
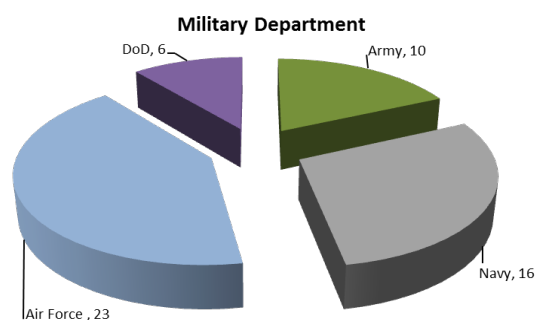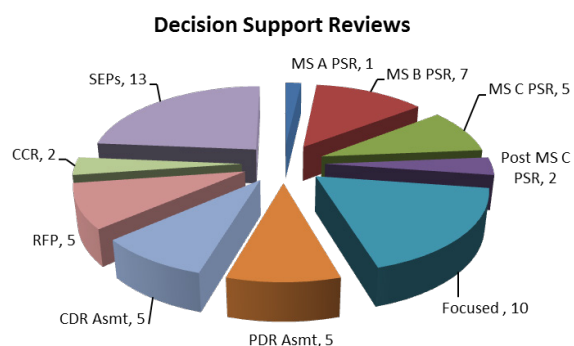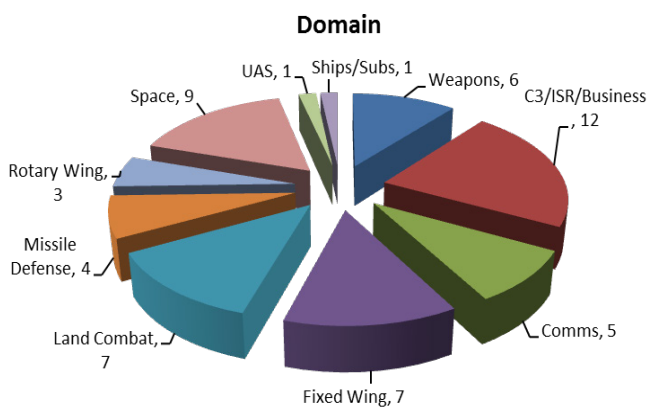- **SEP Approvals: 13**
- **DPAP RFP Peer Reviews: 5**

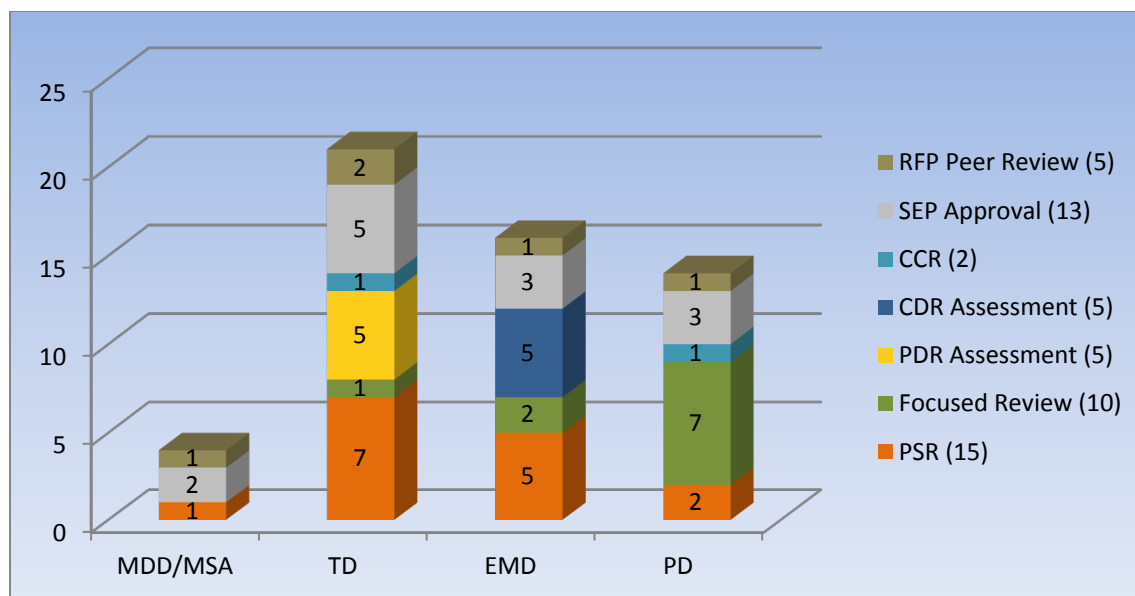**Figure 2-2. FY 2013 DASD(SE) Assessments by Domain and Military Department**

Figure 2-3. FY 2013 DASD(SE) Assessments by Acquisition Phase

2.2.4.1 Defense Acquisition Program Support (DAPS) Methodology

DASD(SE) developed and employs the DAPS methodology to assess program planning and execution during PSRs and other technical reviews. First published in October 2004, the methodology is now in draft version 3.0. DASD(SE) revises the document to align with current policy, and DASD(SE) plans to revise the methodology in FY 2014 to address a pending update to DoDI 5000.02, "Operation of the Defense Acquisition System."

The DAPS methodology provides a robust listing of programmatic and technical areas, sub-areas, factors, and assessment criteria, developed to be both broad in scope and sufficiently detailed to be applicable to programs of all types. DASD(SE) derived the methodology from numerous sources in the defense acquisition community to reflect the knowledge and acquisition experience from both Government and industry. For each review, DASD(SE) adapts the methodology to a program's current development phase and conditions.

DASD(SE) uses the DAPS methodology to structure the scope and focus of review areas to ensure a consistent approach across programs and to ensure sufficient depth of review in relevant areas. Review teams analyze program documentation and conduct site visits to program offices and contractor facilities for interviews and discussion. PSR teams identify program strengths, weaknesses, risks, and issues, while assessing root causes as the basis for findings and recommendations. DASD(SE) briefs and adjudicates findings and recommendations with the program managers before finalizing the report, which is then provided to the program office, briefed internally within DASD(SE), and summarized at the OIPT. DASD(SE) captures relevant non-attributed results in a database for systemic analysis (see 2.2.5) to inform the assessment process and future DoD policy and guidance.

DASD(SE) developed an automated DAPS tool to facilitate review preparation and enable consistency in team assessments and reporting. The beta version of the tool is currently being tested on two pilot PSRs and will be further developed in FY 2014.

2.2.4.2 Schedule Risk Assessment

DASD(SE) performs assessments of program Integrated Master Schedules (IMS) and supporting documentation to track and compile critical schedule artifacts and risk elements. Using a software tool, DASD(SE) conducts a 14-point schedule assessment to evaluate the quality of the IMS. DASD(SE) evaluates the program's execution to plan, identifies schedule risk areas, and provides feedback to the PMO. The IMS assessments increase a program office's ability to use the schedule as a program management tool to assess schedule risk. In FY 2013, DASD(SE) saw an improvement in the quality of schedules for programs reviewed.

2.2.4.3 Software Assessment

During program engagements, DASD(SE) assesses software acquisition and development, and conducts quantitative software analysis. DASD(SE) focuses on software early in the acquisition life cycle to ensure the software requirements and functions trace to the operational context (e.g., Concept of Operations, mission threads, architecture) and to ensure programs conduct critical technical activities and manage software risk.

DASD(SE) uses acquirer, developer, and supplier software metrics to assess schedule feasibility and software maturity. DASD(SE) collects and tracks software metrics to enable benchmarking of programs' software schedule duration, performance, staffing, and quality across DoD's warfare domains. DASD(SE) compares planned software development against industry trend lines and against a program's own historical performance when available to highlight statistical outliers.

During FY 2013, through program engagements such as PSRs and Software Focused Reviews, DASD(SE) identified issues in the areas of:

- Software staffing
- Software schedule planning and management
- Software metrics and related quantitative management
- Software integration
- Software quality assurance
- Software requirements management
- Software maturity

As a result of the program engagements, DASD(SE) provided the following support to acquisition programs in the area of software engineering:

- Assisted program managers in the development of software metrics and tracking plans.

- Assessed programs' software development schedule feasibility; assisted programs in establishing realistic schedules and in improving software release planning.

- Assisted programs in developing software quality assurance plans.

- Assessed programs' readiness for operational test events based on software maturity.

2.2.5 Systemic Root Cause Analysis

DASD(SE) performs SRCA of findings identified during PSRs, Focused Reviews, and Nunn-McCurdy reviews. The SRCA database provides an effective and secure method for analyzing more than 8,700 findings from more than 123 reviews of MDAP and MAIS programs across all warfare domains in order to identify the most prevalent issues. Through SRCA, DASD(SE) identifies opportunities to improve acquisition performance through updates in policy, education, and effective systems engineering practices.

In FY 2013, DASD(SE) added seven new reviews (five PSRs, two Focused Reviews) to the systemic analysis database, equating to approximately 534 new findings. The analysis produced 49 negative systemic findings. The 7 positive systemic findings point out areas of effectiveness across 10 percent or more of the programs reviewed. Leading systemic categories continue to be: program schedule, management structure and communications, risk management, staffing, design verification and validation, and requirements development.

The FY 2013 SRCA results inform systems engineering-related areas including the DAG, Schedule Risk Assessments, the DAPS methodology, SEP guidance, reliability, metrics and benchmarking, and the Risk Management Guide. DASD(SE) has analyzed the systemic findings with respect to domains, Service, Program Executive Office (PEO), prime contractor, acquisition phase, and specialty area (e.g., human capital, schedule, software) to identify trends and allow for focused and tailored feedback.

2.2.6 Defense Acquisition Executive Summary Reporting

USD(AT&L) requires quarterly DAES assessments of MDAP and MAIS program performance. Approximately one-third of the programs are reviewed each month of the quarter. The DAES assessments are documented in the OSD Defense Acquisition Management Information Retrieval (DAMIR) repository each month.

During 1st quarter FY 2013, DASD(SE) prepared two DAES assessments on each program: one on system performance and one on program production. In response to the USD(AT&L) DAES guidance in December 2012, beginning in 2nd quarter FY 2013, DASD(SE) assessments increased to five per program, adding schedule, management, and interoperability/information security. As a result, DASD(SE) now prepares approximately 450 quarterly DAES assessments. The exact number of assessments fluctuates as programs are continually added or removed from the reporting list. Some programs are split into subprograms that are assessed separately. In FY 2013, DASD(SE) performed 1,345 assessments on 102 programs (77 MDAPs and 25 MAIS programs). No DAES assessments were performed in August 2013 because of the Government furlough.

OSD offices with oversight in designated DAES assessment areas recommend programs for a more detailed DAES Review by USD(AT&L). DASD(SE) participated in the DAES Review of 34 (29 MDAP and 5 MAIS) programs in FY 2013.

2.3   Workforce

As the Functional Leader for the Engineering (ENG) and Production, Quality, and Manufacturing (PQM) acquisition workforce career fields, DASD(SE) continues to ensure that the acquisition engineering workforce is trained, certified, and qualified to meet the Department's complex engineering requirements. DASD(SE) provides career field advocacy, oversight, and guidance to the defense acquisition workforce personnel responsible for providing systems engineering, manufacturing, and quality expertise. During FY 2013, DASD(SE) led efforts to improve the professionalism of the acquisition engineering workforce by realigning the workforce competency areas and taking a leading role to improve the standards for those in KLPs.

2.3.1   DAWIA Career Paths and Career Fields

In FY 2013, DASD(SE) recommended to the USD(AT&L), and the USD(AT&L) approved, the retirement of the Program Systems Engineer (PSE) acquisition career path within the SPRDE career field. The SPRDE career field was renamed Engineering (ENG), and all personnel from the SPRDE-PSE and SPRDE-Engineering (SE) career paths were transferred to the ENG career field. This consolidation is expected to simplify processes, reduce cost, and leverage the SPRDE-PSE workforce expertise across the larger acquisition engineering workforce.

The ENG Functional Integrated Product Team (FIPT) reviewed all the related certification requirements to incorporate selected aspects of the PSE certification standards into the ENG certification standards as appropriate. DASD(SE) approved adding the following core requirements to each of the respective ENG certification levels:

- ENG Certification Level 1:
    - CLE 001 - Value Engineering
    - CLE 004 - Introduction to Lean Enterprise Concept
- ENG Certification Level 2:
    - LOG 103 - Reliability, Availability, and Maintainability
- ENG Certification Level 3:
    - CLE 012 - Open Systems Architecture
    - CLE 068 - Intellectual Property and Data Rights

In the role as Functional Leader, DASD(SE) ensures that the workforce education, training, and experience certification standards are relevant and valid. DASD(SE) oversees the DAU courses for the ENG and PQM career fields, ensuring that the career field certifications are appropriate, current, technically accurate, and consistent with current engineering policy and guidance.

Competency Models. In FY 2013, the DASD(SE) directed the ENG (then SPRDE-SE/PSE) FIPT to review and update the Systems Engineering Competency Model. Competencies are the set of skills, knowledge, characteristics, and traits that contribute to outstanding performance in a particular career field. A competency model is a collection of measurable knowledge, skills, abilities, behaviors, and other characteristics that an individual needs to perform work roles or occupational functions successfully.

A major improvement to the competency model was the addition of two new focused sections on Business Acumen and Professionalism. The second improvement included alignment of the competency model to the updated DAG Chapter 4 on Systems Engineering. DASD(SE) reviewed and approved the new Systems Engineering Competency Model in June 2013.

At the request of the Functional Leader, the PQM FIPT also reviewed the PQM Competency Model for currency and completeness. The FIPT updated the PQM Competency Model to align with the DoD Manufacturing Readiness Level (MRL) Deskbook, and to incorporate the DAU recommended Business Acumen competencies and the PQM FIPT Chair's recommended Professionalism competencies.

DAU Curriculum. DASD(SE) continues to collaborate with DAU to ensure the technical currency of the ENG and PQM curriculums. In FY 2013, an effort began to update all ENG and PQM courses to reflect the updated DAG Chapter 4, draft DoDI 5000.02, the new ENG and PQM Competency Models, and initiatives driven by Better Buying Power 2.0. Work on this effort will continue into FY 2015, when all updated courses will be completed. Specific examples of changes to ENG and PQM courses include:

- SYS 101, Fundamentals of Systems Planning, Research, Development, and Engineering: Revising course to reflect the updated DoDI 5000.02, DAG Chapter 4, and SE Competencies.

- SYS 202, Intermediate Systems Planning, Research, Development, and Engineering: Restructuring the online course presentation approach based on student feedback.

- SYS 203, Intermediate Systems Planning, Research, Development, and Engineering: Revising course to incorporate new policy, guidance, and associated competencies that reflect the new life cycle models from the updated DoDI 5000.02. Additions to the course will also provide a thorough understanding of OSD policy and systems engineering throughout these life cycle models.

- SYS 302, Technical Leadership in Systems Engineering: Replacing the current case study, which is based on a fictional Department of Homeland Security communication system, with 10 separate case studies more aligned with the DoD Military Departments and domains (space satellite, ground-based weapon systems, etc.). Additions to the course also will include content and brief discussions on PPP, security engineering, and other key systems engineering concepts being deployed by the Department.

- PQM curriculum: Revising the full curriculum based on the updated PQM Competency Model as well as to reflect the updated DoDI 5000.02, DAG Chapter 4, and PQM Competencies.

2.3.2 Acquisition Engineering Workforce Initiatives

DASD(SE) continues to lead and support workforce development initiatives including efforts to build the capability and capacity of the acquisition workforce. To support the Better Buying Power 2.0 focus area to improve the professionalism of the defense acquisition workforce, and at the request of the USD(AT&L), DASD(SE) is leading the development of a qualification process for acquisition professionals who could potentially be selected for lead roles in MDAPs and MAIS programs. DASD(SE), with the support of the ENG FIPT, is developing the KLP Qualification Board and the supporting processes and deployment tools. The Qualification Board's purpose is to certify acquisition workforce personnel as qualified for KLPs on these critical acquisition programs. In FY 2013, the board began establishing the KLP qualification process and will continue its work in FY 2014.

DASD(SE) efforts continue in the development of guides, tools, and supporting competency models as well as training specific to acquisition workforce members working in specialty engineering areas. These specialties include R&M engineering, manufacturing, and program protection planning. In FY 2013, DASD(SE)-led working groups completed significant work in developing process guides and workforce competencies related to R&M engineering. The working groups documented processes to support similar development efforts for the Manufacturing and PPP engineering specialties.

An emerging challenge having an impact on workforce initiatives is that in addition to normal attrition, a large number of experienced systems engineers and analysts are expected to retire within the next 5 to 10 years. Without new or innovative hiring and retention capabilities, the Government systems engineering workforce will be fundamentally reshaped in size and capability into a significantly smaller workforce. DASD(SE) will need to partner with the Military Departments to assess the impact and identify potential remedies to adapt to this new work environment.

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3   DASD(SE) ASSESSMENTS OF MILITARY DEPARTMENTS

3.1   Assessment Overview

DASD(SE) requested that each Military Department (Army, Navy, and Air Force) submit a systems engineering self-assessment to be included in this year's Systems Engineering Annual Report to Congress. DASD(SE) asked each Department to describe its overall systems engineering strategy, to include priorities, milestones and measures of success. The Military Departments were also asked to provide an update of FY 2013 progress and FY 2014 plans to improve their organization's systems engineering capability, in accordance with the reporting requirements in Pub. L. 111-23, Title I, Sec. 102(b), as amended by Pub. L. 111-383, Title VIII, Section 813(a):

> The service acquisition executive of each military department and each Defense Agency with responsibility for a major defense acquisition program shall develop and implement plans to ensure the military department or Defense Agency concerned has provided appropriate resources for…
>
> > (B) Development planning and systems engineering organizations with adequate numbers of trained personnel in order to—
> >
> > > (i) support key requirements, acquisition, and budget decisions made for each major defense acquisition program prior to Milestone A approval and Milestone B approval through a rigorous systems analysis and systems engineering process;
> > >
> > > (ii) include a robust program for improving reliability, availability, maintainability, and sustainability as an integral part of design and development within the systems engineering master plan for each major defense acquisition program; and
> > >
> > > (iii) identify systems engineering requirements, including reliability, availability, maintainability, and lifecycle management and sustainability requirements, during the Joint Capabilities Integration Development System process, and incorporate such systems engineering requirements into contract requirements for each major defense acquisition program.

The Military Departments were asked to describe workforce development initiatives for their systems engineering workforce and were asked to provide a discussion of additional authorities or resources needed to attract, develop, retain, and reward systems engineers. Due to increased interest from Congress in the size and capability of the systems engineering workforce, the Military Departments expanded their reporting to include civilian, military, and contractor personnel supporting Government systems engineering functions.

The Departments of the Army, Navy, and Air Force systems engineering self-assessments are provided in their entirety in Appendices A though C, respectively. DASD(SE) used the self-assessments and met with the systems engineering leadership of each Military Department to review

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their organizations and capabilities and to identify needed changes or improvements to their organizations' capabilities and policies in accordance with 10 U.S.C. 139(b).

3.2   Systems Engineering Strategy

The Military Departments continue to evolve their strategies to improve systems engineering, including changes to enterprise-level systems engineering organization, policy, and practice. Their plans emphasize priorities, and include clear objectives, milestones, and measures for success. They also include systems engineering contributions to help achieve affordable programs and perform oversight of lower ACAT-level programs.

In FY 2013, the U.S. Army's Office of the Chief Systems Engineer merged with the Army's System of Systems Integration office to become the System of Systems Engineering and Integration (SoSE&I) Directorate. SoSE&I, under the Assistant Secretary of the Army for Acquisition, Logistics, and Technology, provides coordinated system of systems (SoS) analysis, engineering, architecture, and product integration support to facilitate how the Army efficiently shapes, manages, validates, and synchronizes the fielding of integrated materiel capabilities. The Army has established a broad set of focus areas/objectives and fundamental principles to strengthen its systems engineering capability. PEO Aviation and PEO Missiles and Space are identified as leading examples of early success in implementation.

The Department of the Navy's (DON) engineering structure comprises four Systems Commands (SYSCOM): Naval Sea Systems Command (NAVSEA), Naval Air Systems Command (NAVAIR), Space and Naval Warfare Systems Command (SPAWAR), and the Marine Corps Systems Command (MCSC). Representatives of the SYSCOMs work together to advance the U.S. Navy's systems engineering practice through their Systems Engineering Stakeholders Group (SESG). The Navy made good progress in FY 2013 to revise the Naval Systems Engineering Guidebook and plans to make the guide available as an online interactive product in FY 2014.

DASD(SE) looks forward to FY 2014 progress reports on how the Navy effectively develops the working relationships between SYSCOM Technical Authority, Deputy Assistant Secretary of the Navy for Research, Development, Test and Evaluation (DASN (RDT&E)) Chief Systems Engineer (CHSENG), and an acquisition program's technical chain of command. In late FY 2013, DASN (RDT&E) initiated a Systems Engineering Streamlining Initiative (SESI) to identify efficiencies in current systems engineering processes without compromising sound technical, engineering, and safety risk management strategies. This initiative will report out in FY 2014 and, coupled with Better Buying Power 2.0 and the final update of DoDI 5000.02, will provide a foundation for continued improvement of the Navy's system engineering enterprise.

With the designation of the Deputy Assistant Secretary of the Air Force (Science, Technology, and Engineering) (SAF/AQR) as the Air Force Chief Engineer and Technical Authority for all Air Force acquisitions, the Air Force is also taking a significant step toward revamping its systems engineering capabilities. To provide SAF/AQR the support necessary to execute its Air Force Chief Engineer responsibilities, SAF/AQ reorganized its staffing structure by providing SAF/AQR an SES-level Deputy dedicated to leading Air Force engineering efforts and reconstituted the SAF/AQRE division. In addition, the Air Force stood up a unified Air Force Engineering Enterprise (AFEE) with a clear

governance structure. The impact of these reorganizations on the Air Force's systems engineering capabilities is promising. DASD(SE) looks forward to a better understanding of clear roles and responsibilities within the AFEE technical support to programs as SAF/AQR develops the AFEE as a key FY 2014 objective.

DASD(SE) recommends the Military Departments continue to strengthen their systems engineering capabilities through rigorous program planning. The Interim DoDI 5000.02 emphasizes a range of defense acquisition program models. An FY 2014 challenge for the Military Departments is to update their strategies so their technical capabilities can be brought to bear in helping provide program structures and procedures tailored to the characteristics of the product being acquired and a program's unique circumstances.

3.3 Development Planning and Early Systems Engineering

The Military Departments provided evidence of their FY 2013 progress and discussed FY 2014 plans to address adequate resources for development planning and systems engineering organizations in order to: "(i) support key requirements, acquisition, and budget decisions made for each major defense acquisition program prior to Milestone A approval and Milestone B approval through a rigorous systems analysis and systems engineering process."

The Army made progress in development planning through its development of tools, trade-off methodology, and technology maturation. The Army needs to, and has committed to, continue to support systems engineering activities, methodologies, and tools for use during early acquisition phases across their enterprise. The Army's efforts to develop and implement a set of guiding documents, consistent with Army Regulation 70-1, "Army Acquisition Policy," should continue progress to a more robust development planning capability. SoSE&I is already becoming more involved in PEO/PM activity early in programs, and at an enterprise level the Army is moving to implement a Model-Based Systems Engineering methodology. DASD(SE) looks forward to evidence of its positive impacts in FY 2014.

The Navy has had several of its acquisition organizations actively participating in the DASD(SE)-chaired DPWG during FY 2013. The Navy made good progress in describing the technical activities to be performed during the Materiel Solution Analysis phase both in parallel with and following an AoA. The Navy has been proactive in collaborating in the DPWG to develop the process of integrating science and technology efforts along with Warfighters/combat developers and the acquisition community prior to MDD. The Navy expects to release the new interactive Naval Systems Engineering Guidebook (NSEG) as well as the Naval System of Systems Engineering Guidebook in FY 2014. Both should add significantly to the body of knowledge associated with early systems engineering.

The Air Force reissued the Air Force Instruction (AFI) 63-101, "Integrated Life Cycle Management," in FY 2013. The instruction streamlined systems engineering policy and guidance for technology programs in the form of AFRLI 61-104, "Science and Technology Systems Engineering."

DASD(SE) recommends the Military Departments continue to strengthen development planning and early systems engineering capabilities in support of acquisition programs. The change directed in the

Interim DoDI 5000.02, that the program manager be selected and the program office established before Milestone A, should serve as a demand signal for this recommendation. DASD(SE) believes each Military Department will need to continue to initiate programs with a sound technical foundation that effectively and affordably meet operational needs.

3.4 Reliability and Maintainability

Since the release of Directive Type Memorandum (DTM) 11-003, "Reliability Analysis, Planning, Tracking, and Reporting," in March 2011, the Military Departments have all taken steps to reinvigorate the R&M engineering discipline. The DTM[1] requires that each Military Department formulate a comprehensive R&M program for all MDAPs that includes mandatory engineering activities as well as key systems engineering planning for R&M. In FY 2013, the Military Departments, through acquisition policy, training, and workforce development activities, have shown progress in implementing the DTM and revitalizing R&M engineering.

The Army R&M community continues to be actively engaged within the Army and with DoD. This includes continuing to host an R&M Working Group that includes senior participants across the Army to conduct R&M assessments of Army MDAPs and collect lessons learned. In addition, the Army established a Reliability Systemic Working Group that supports the T&E Efficiencies Task Force. The Army Center for Reliability Growth continues to support Army R&M engineering activities in the areas of policy, guidance, standards, methods, tools, and training. The Army also continued developing the Army R&M policy, AR 702-3, "Army Materiel Systems Reliability, Availability, and Maintainability," which is in final draft. Efforts were delayed one year due to budget constraints, sequestration cuts, and personnel furloughs. The publication of AR 702-3 is planned for CY 2014.

The Navy continues to implement DTM 11-003 across the four SYSCOMs. DASN (RDT&E) R&M engineering staff worked with individual SYSCOMs on R&M activities such as the rollout of the DAES reliability growth reporting. The Navy's Department-wide activities are coordinated through the DON R&M Leads Working Group, which flows down to the SYSCOM-level working groups. Based on Navy policy, all ACAT levels are required to document their R&M engineering planning in their SEPs. To assist programs, an R&M appendix has been added to the NSEG. For training needs, several legacy R&M courses have been updated and deployed with success. In FY 2014, DASN (RDT&E) R&M will work with SPAWAR R&M engineering to implement an effective Command-level failure reporting, analysis, and corrective action system (FRACAS) process, beginning with early engineering development and integration efforts, and continuing throughout the life cycle.

The Air Force continues to implement R&M policy and guidance. The Air Force acquisition policy, AFI 63-101/20-101, was revised to include specific R&M activities and responsibilities. In addition, the Air Force Life Cycle Management Center (AFLCMC) continues to integrate R&M expertise across the Department through its R&M Working Group, which provides a collaborative community of practice for R&M leadership in the Air Force. To improve the R&M performance of Air Force acquisition programs, AFLCMC initiated the first annual R&M Program Health Assessment aimed at providing insight on the health of a program's processes, products, and expertise. At the practitioner

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[1] DTM 11-003 was cancelled and its content incorporated in Interim DoDI 5000.02 released on November 26, 2013.

level, AFLCMC has created Individual Development Plans to ensure that R&M trainees receive the appropriate specialized education needed to support R&M requirements for Air Force acquisition programs. As part of the training needs for individuals, Air Force Institute of Technology (AFIT) provided foundational R&M training to more than 160 individuals in FY 2013 through its two R&M courses. A third complementary Reliability Course is being developed by AFIT and is scheduled for deployment in FY 2014.

DASD(SE) recognizes the steps that each Military Department has taken to reenergize the R&M engineering discipline. While each Military Department has made strides in creating a network of policies, practices, and tools to ensure R&M is considered upfront, DASD(SE) also recognizes that an appropriate workforce will be required to support the framework. The Military Departments must continue to focus on ensuring they retain a workforce with adequate capacity and capability to meet future acquisition demands.

3.5   Systems Engineering in JCIDS and Contracting

The Military Departments provided evidence of their FY 2013 progress and discussed FY 2014 plans to ensure they have provided appropriate resources for development planning and systems engineering organizations in order to: "(iii) identify systems engineering requirements, including reliability, availability, maintainability, and lifecycle management and sustainability requirements, during the Joint Capabilities Integration Development System process, and incorporate such systems engineering requirements into contract requirements for each major defense acquisition program."

The Army continues to address the challenge of applying systems engineering talent during Pre-Milestone A on associated JCIDS activities. In 2013, the Army made some progress in establishing closer coordination among various Army communities involved with the JCIDS development process. The Army also continued to be actively engaged in JCIDS-relevant topics being addressed through the DASD(SE)-chaired DPWG. The momentum around the newly formed SoSE&I Directorate may serve as a catalyst to help in this area.

The Navy has long been a leader in synchronizing its acquisition model with JCIDS through the Naval Gate Review process. The challenge in FY 2014 will be maintaining this concept in light of the numerous acquisition models identified in the Interim DoDI 5000.02. In FY 2013, MCSC established Milestone Assessment Team (MAT) reviews to assess the programmatic and technical health of programs. The MAT along with the Determination Meeting Process (DMP) and Requirements Transition Team (RTT) initiatives should build on this synchronization success.

The Air Force envisioned a tighter linkage between requirements development and acquisition when it established the Air Force Requirements Review Group (AFRRG). The group met regularly in FY 2013 and has served to ensure that requirements are being properly vetted prior to proceeding to the Air Force Requirements Oversight Council (AFROC). Also this year, the Air Force worked to improve development planning activities by forming a pre-planning team in SAF/AQR, which quickly moved to identify overlaps and gaps in Air Force policy and guidance associated with early systems engineering. This work will continue in FY 2014.

The Interim DoDI 5000.02 introduces a range of changes associated with the Technology Maturation and Risk Reduction phase that, taken together, encourage a tighter coupling between JCIDS, systems engineering, and contract actions. Systems engineering will need to support the program, preceding CDD validation, with a trade-off analysis showing how cost and capability vary as a function of the major design parameters. These results will also directly influence the technical areas of the development RFP. The challenge for the Military Departments is to balance soundness of the capability requirements, the affordability of the program, and the executability of the acquisition strategy.

3.6   Military Department-Identified Areas of Progress and Improvement

The Military Departments provided evidence of their progress against the areas for improvement from their FY 2012 self-assessment and new areas where they chose to report their department's improved systems engineering capability. They identified and provided plans for addressing FY 2014 priority areas to improve the systems engineering and development planning capability of their department.

The Army has a broad spectrum of initiatives to improve its systems engineering capability. Examples include the SoS Engineering Management Plan, Army Geospatial Enterprise initiative, and various architecture pursuits. Because of FY 2013 budget limitations, however, progress on several initiatives (e.g., in the area of development planning across the enterprise) was limited.

The Navy has robust efforts at all SYSCOMs to address the increasing complexity of modern weapons and interdependencies with other on- and off-board systems within the battlespace. For example, MCSC has developed a Framework for Assessing Cost and Technology (FAST) tool. NAVAIR has created an Integrated Warfighting Capabilities (IWC) Enterprise Team. SPAWAR has several new directorates to support SoS engineering. NAVSEA is revitalizing its research and systems engineering competencies by building stronger engineering communities of practice and infrastructure working groups across the enterprise. The two guidebooks mentioned earlier will serve as integrating bodies of knowledge to capture best practices for mission engineering/SoS engineering.

The Air Force identified several areas of technical progress this year including corrosion prevention, human systems integration (HSI), standardization, and environmental management. The Air Force has significant research under way to find alternatives to toxic, but effective, chromium-based coatings to prevent corrosion. Recent events have revealed weaknesses in HSI that are being addressed in a holistic fashion, from organizational changes to updates in guidance and refreshed DAU educational offerings. Initiatives in environmental management include changing practices to address orbital space debris and risk-mitigation techniques for spectrum use.

DASD(SE) commends the Military Departments on their continuing efforts to address other planned areas for improvement. The challenge for FY 2014 will be to sustain and complete efforts with constrained resources.

3.7   Workforce Initiatives

The U.S. engineering workforce has reached a critical state. Current trends indicate that the demand for a technical workforce will increase, yet there are not enough individuals pursuing science, technology, engineering, and mathematics (STEM) career fields to fill the demand. Several analyses point to the need to add approximately 1 million more STEM professionals than the U.S. will produce at current rates (President's Council of Advisors on Science and Technology 2012).

DoD strives to recruit the best engineers to develop and manage weapon systems. The Department faces a challenge to fill its ranks with a suitable share of the available engineering workforce, "particularly given the current perception of many young graduates, in particular Ph.D. candidates in the sciences, that working in government is less compelling, though still attractive, than careers in academic teaching and research or industry" (NRC 2012).

The following findings predate the furloughs and Government shutdown that took place at the start of FY 2014. Any acquisition workforce–related implications resulting from the furloughs and Government shutdown are not reflected. The impacts of these events, in addition to reductions in budgets, are expected to compound the Department's efforts to attract, hire, and retain top engineering talent.

3.7.1   The Impending Talent Gap

Three major trends — (1) the aging Government workforce, (2) a shrinking talent pool, and (3) different job expectations of younger generations—will soon create a gap between the supply of and demand for skilled Government workers. These trends create challenges for Government agencies to overcome.

3.7.1.1   Aging Government Workforce

As evidenced by a Georgetown University study (Carnevale and Cheah 2013), finding jobs for recent college graduates in the engineering, computers, and mathematics fields is critical to building the pool of technical workers. These graduates are the talent pipeline for DoD, as well as for other U.S. agencies, to fill the depleting engineering workforce gap as much of the workforce retires. Currently, 13.8 percent (5,467 of 39,639) of the acquisition systems engineering workforce is eligible to retire or will be within the next 5 years (AT&L Defense Acquisition Workforce Data Mart, June 30, 2013).

Studies have long predicted a wave of federal retirements (NRC 2012). Current age demographic trends within the acquisition systems engineering workforce show a lack of workers aged 35-55 (Figure 3-1). Thus, the individuals under 35 are the future of the workforce (AT&L Defense Acquisition Workforce Data Mart, June 30, 2013).
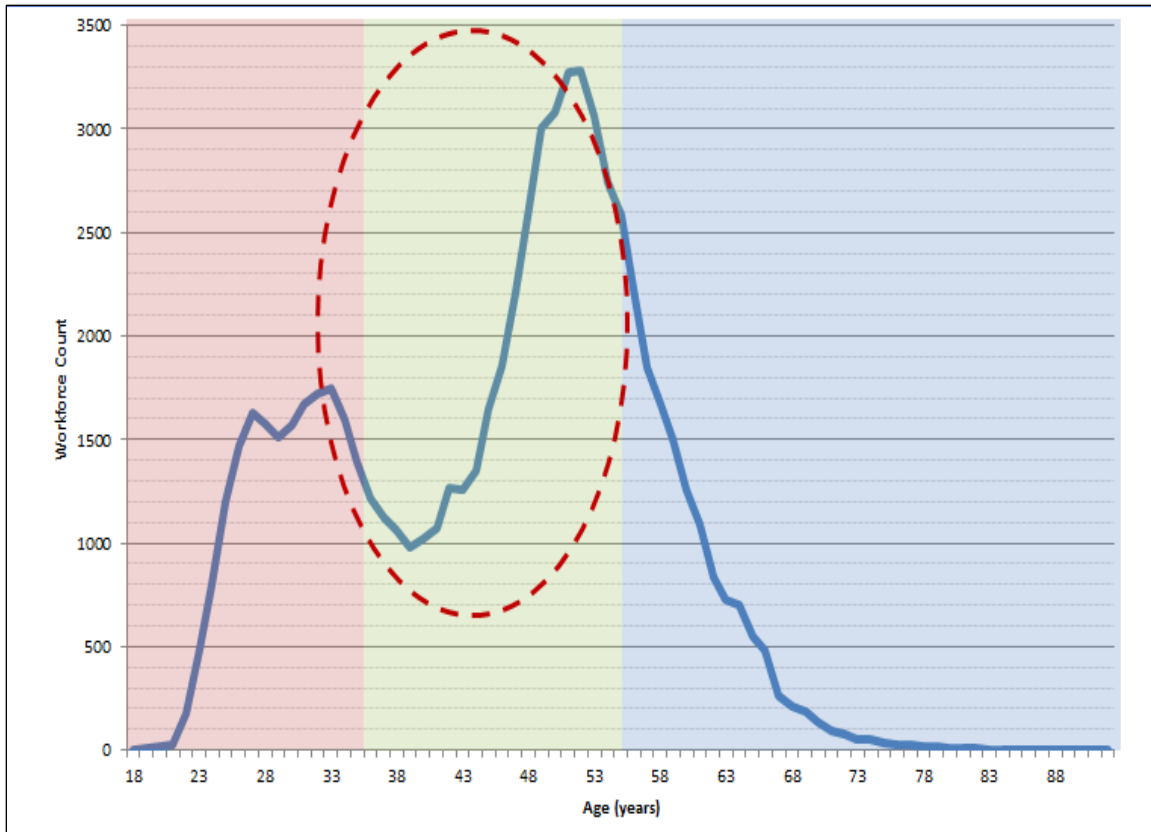
Figure 3-1. Engineering Workforce Age Demographics

The Government is not alone in facing this challenge. Large portions of the workforce in other sectors, including aerospace and the defense industry (Figure 3-2), will become eligible for retirement by 2014 . To compound DoD's challenge, "aerospace and defense companies report that the three most difficult to fill positions are in systems engineering, aerospace engineering, and mechanical engineering" (NRC 2012).

3.7.1.2 Shrinking Talent Pool

Another challenge facing the Government, as well as the defense industry, is a supply gap of new professionals to replace the aging engineering workforce. The rates of science and engineering degrees being conferred in the United States, as compared with the rest of the world, are relatively low (Figure 3-3).
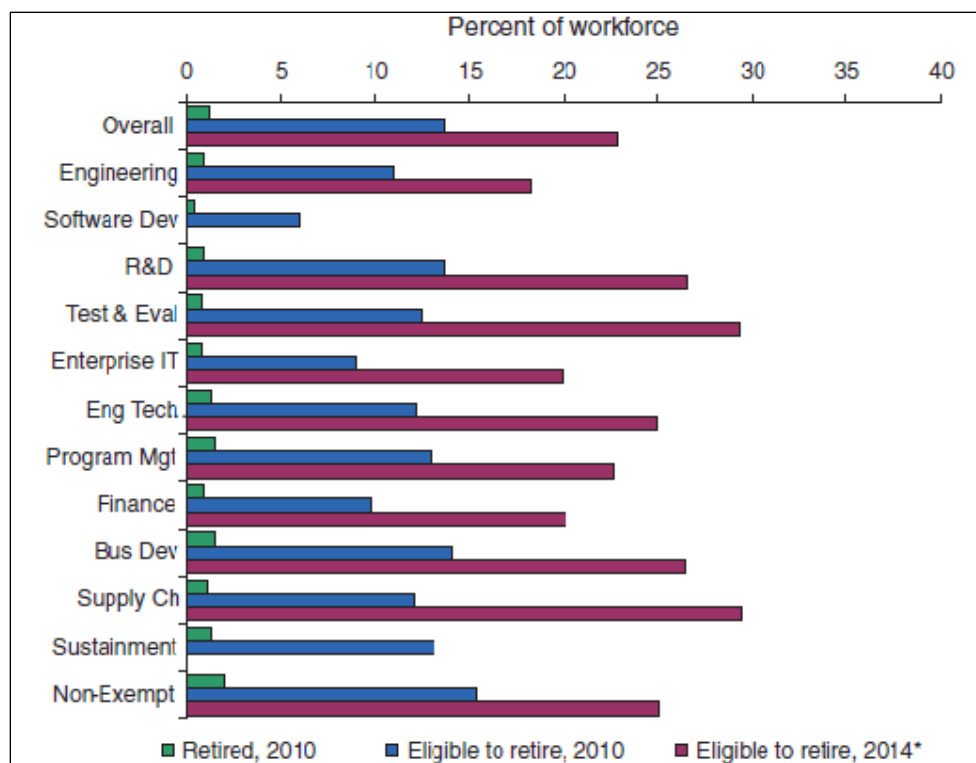
Source: NRC 2012

Figure 3-2. Defense Workforce Eligible to Retire by 2014
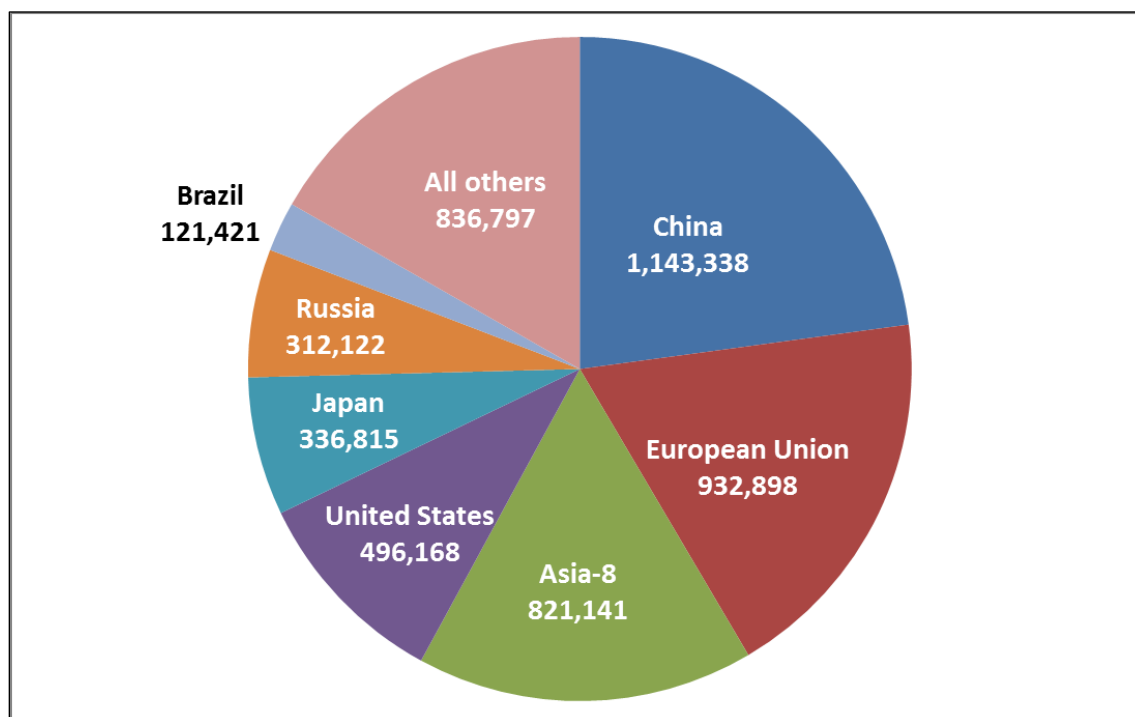
Source: NRC 2012

Figure 3-3. Bachelor Degrees in Science and Engineering Conferred, by Country

Also within the United States, over the past 10 years, there have been no significant increases in STEM bachelor's and associate degrees, as compared with total bachelor's and associate degrees (Figure 3-4), further creating a critical engineering workforce gap.
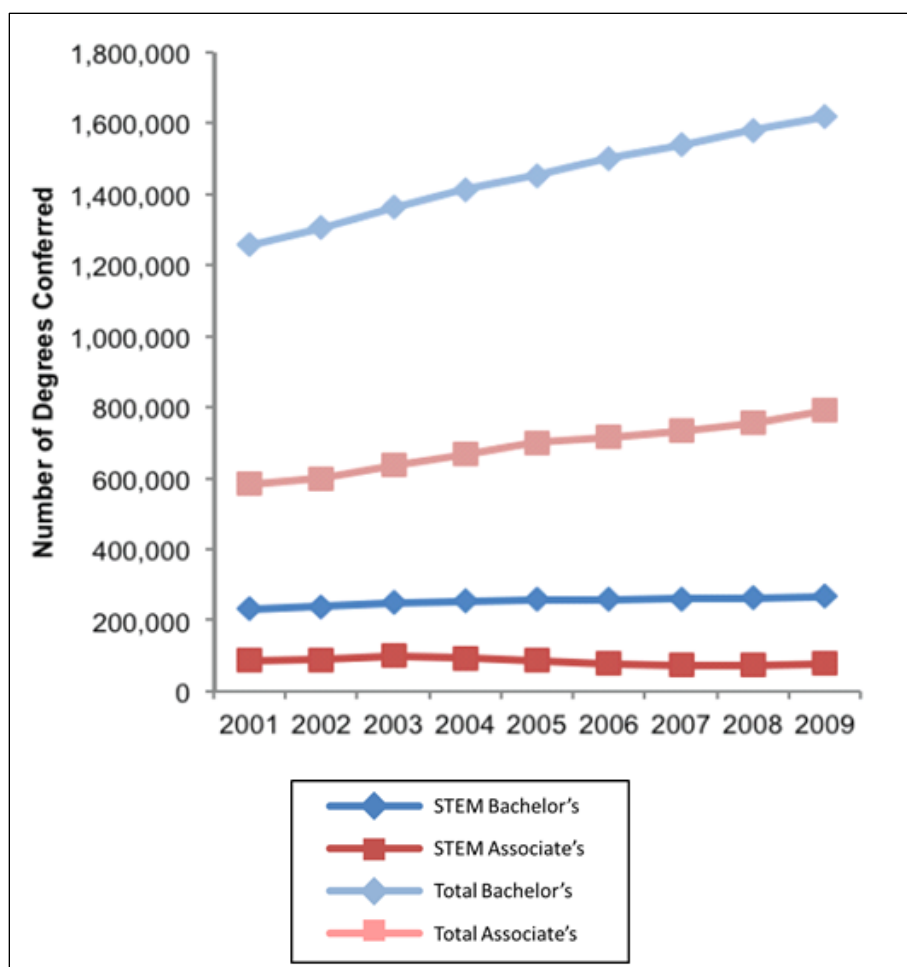
Source: Data from Office of Science and Technology Policy

Figure 3-4. U.S. STEM Degrees Conferred, 2001–2009

3.7.1.3 Changing Workforce Trends

DoD will continue to face significant challenges in recruiting and retaining strong engineering talent in an improving economy and increasingly competitive job market. The Department needs to develop innovative ways to attract, retain, and shape the current and future STEM workforce to meet mission needs.

Over the past decade, several organizational and economic challenges and changes have resulted in the emergence of a "new worker." The emergent worker crosses age groups, industries, and regions and is expected to redefine the employer-to-employee relationship in the near future. A key characteristic of this emergent workforce is seeking greater career development opportunities. Driven by organizational downsizing and shrinkage of their salaries, benefits, and retirement savings, the emergent workforce is taking a more self-directed approach to developing and advancing their

careers. This is expected to present significant human capital challenges for organizations relying on traditional employment models and fiscal career incentives (Harding 2000).

Reports from the Bureau of Labor Statistics show unemployment trends improving from 9 percent in November 2011 to 7 percent November 2013; the Department of Commerce projects economic growth strengthening in 2014, starting in the first quarter and averaging about 2.6 percent for the year. Industry surveys indicate an increasing focus on STEM jobs in 2014, as more than one in four employers plan to create STEM jobs (Hartley 2014).

3.7.2 Military Department Workforce Initiatives

The Army, Navy, and Air Force each have continued to develop their systems engineering and development planning workforces' capabilities and capacities. Each has used a blend of authorities, tools, and methods for outreach, including but not limited to the Defense Acquisition Workforce Development Fund (DAWDF) (10 U.S.C. 1705), information portals, competency models, and Military Department-based academic institutions to grow and enhance the systems engineering workforce. By identifying and adapting the appropriate authority or resource, the Military Departments have maintained their systems engineering workforce despite recent fiscal constraints on the Department. This section provides a summary of the efforts taken by the Military Departments in FY 2013 and a look forward into FY 2014.

The Army's initiatives for FY 2013 included use of several methods. By collaborating with the Acquisition Support Center, OSD, and other Military Departments, the Army continued to refine the process for identifying and selecting qualified personnel to fill KLPs. The Army has responded to the challenge in retaining, recruiting, and training systems engineers. In an effort to recruit qualified applicants and continue to develop their skills once hired, the Army engages a consortium of universities to develop qualified systems engineers. In FY 2013, 23 engineers from the Army's Research, Development, and Engineering Center graduated from the Naval Postgraduate School (NPS) with a master of science in systems engineering degree. The Army Materiel Command-Edgewood Chemical Biological Center reached an agreement in FY 2013 with Johns Hopkins University to provide a single, limited-participant Introduction to Systems Engineering course.

The Army will continue to strengthen its current workforce during FY 2014 through training and professional certification, including but not limited to Lean Six Sigma training and certification, Agency and Military Department reliability and maintainability training, certification as Certified Reliability Engineers (CRE) through civil organizations, Defense Acquisition Corps membership, and Level III Engineering Certifications. Providing the Army systems engineering workforce with multiple rotational and development assignments will be a key focus for FY 2014 systems engineering development.

The Navy has made rebuilding its acquisition workforce a top priority. During FY 2013, the Navy has actively collaborated with OSD and other Components in improving KLP processes as well as identifying and selecting qualified personnel to fill the critical positions. To prepare the potential KLP workforce, the Navy has provided developmental opportunities including two leadership development programs: the Executive Leadership Development Program and the MITRE Fellowship Program.

Beyond supporting KLPs, the Navy continues to develop its systems engineers through training tailored to specific domains and product areas. This specified training improves the workforce's systems engineering concept and process knowledge and capabilities. For example, NAVAIR developed two courses, one for IBM Rational Systems Architects and another for IBM Rational Software Architects, to support the SYSCOM's effort to meet its interoperability requirements and technical compliance. Using DAWDF funding, NAVSEA developed a comprehensive Technical Authority curriculum to support the integration of DAU ENG career field training within the SYSCOM.

The Navy also has engaged the NPS to support employee development in FY 2013. To provide the greatest impact, NPS programs were developed/adapted to meet the needs of multiple workforce segments, from those seeking graduate-level education to those simply needing to hone specific skills without the need to pursue a former degree. NPS's flexibility and adaptability will continue to make the school a solid partner in FY 2014 and meet the Navy's workforce development needs. Other areas of Navy focus in FY 2014 include the continued refinement of the Naval Systems Engineering Competency Career Model (SECCM). In FY 2013, Navy mapped the SECCM to the DAU Systems Engineering competencies; aligned the model to the knowledge, skills, and abilities at various SYSCOM job levels by SPAWAR; and incorporated feedback and lessons learned. Navy expects other SYSCOMs to engage in the same feedback process of the SECCM in FY 2014.

In FY 2013, the Air Force focused on challenges identified in its FY 2012 acquisition growth initiative. These challenges focused on the Air Force ability to size the acquisition workforce based on program requirements, and to enhance the Air Force's ability to attract and retain highly qualified recent graduates and experienced journeymen. As the workforce stabilized over FY 2013, the Military Department increased its efforts to ensure adequate training and development was provided to its acquisition workforce. Under the oversight of the Engineering Enterprise Strategic Plan working group, the Air Force developed a systems engineering skills taxonomy to align learning needs with instructional design.

In FY 2013, the Air Force fully implemented its acquisition workforce branding and enterprise recruiting strategies. Tailored to the unique challenges of each acquisition product, sustainment, and test location, this effort included development and maintenance of recruiting websites, enterprise-wide advertising, and other recruitment materials and tools. During FY 2013, the Air Force partnered with OSD and the other Components in improving KLP processes as well as applying established processes for identifying and selecting qualified personnel to fill the critical positions.

In FY 2014, the Air Force's Engineering Council will lead efforts to provide a focused workforce development and assignment process across the Air Force and to provide highly qualified and capable systems engineers to program offices and stakeholders as required. This effort includes consciously grooming the Military Department's systems engineering workforce from the moment members are recruited throughout their entire career. Also in FY 2014, the Air Force plans to implement an advance replenishment hiring strategy that uses DAWDF funding to hire recent graduates in advance of forecast attrition and retirements. This strategy provides a productive bench to replace losses, enabling acculturation, initial skills training, and knowledge transfer prior to the retirees' departure.

3.7.3 Additional Authorities and Resources Required

Overall budget cuts have and will continue to impact the acquisition workforce and the ability to develop internal core systems engineering expertise across the DoD. Within the systems engineering community, an increased rate of retirement of experienced systems engineers and analysts has resulted in a projected shortfall of qualified senior-level systems engineering leaders within the next 5 to 10 years. Support from Congress in continuing intern and associate programs to keep the pipeline of younger systems engineers primed is crucial to future workforce resourcing.

3.7.4 Total DoD Systems Engineering Workforce

Table 3-1 shows workforce data for each Military Department and DASD(SE), including the total number of Government (civilian and military) acquisition-coded personnel in the ENG[2] career field for FY 2005 through FY 2013 and the planned growth of the personnel from FY 2014 through FY 2018. The total number of ENG personnel is projected to be 38,026 by the end of FY 2018, a growth of 44 since the end of FY 2012. Overall, the total acquisition workforce in the Military Departments decreased by 1.4 percent between FY 2012 and FY 2013.

The total Army acquisition workforce assigned to ENG positions decreased from 9,812 in FY 2012 to 9,374 in FY 2013. The main reason for the continued personnel losses was attrition primarily due to Separation Incentive Pay and Voluntary Early Retirement Authority. In addition, target hiring levels for civilian acquisition workforce engineering personnel were reduced due to budgetary uncertainty. Military positions coded ENG are expected to remain steady.

The Navy ended FY 2013 with 19,589 personnel assigned to ENG positions, an increase of 91 from FY 2012. The Military Department recognized that systems engineering becomes more critical in a fiscally constrained environment. As systems engineers with more than 30 years of experience begin to retire, they are often replaced with systems engineers with less than 10 years of experience. This loss of experience and the growing inability to hire the next generation of systems engineers inhibits the ability of Navy SYSCOMs to maintain and sustain an experienced workforce.

In FY 2013, the Air Force ended with 8,474 personnel in ENG positions, a decrease from FY 2012 of 175. The Military Department is currently assessing the impacts of the hiring freeze, sequestration, and furloughs on the workforce. Initial indications are that the total Air Force systems engineering workforce separation rates remain below the rates for the total Air Force.

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[2] The SPRDE acquisition career field was renamed ENG effective September 30, 2013, and the two previous career paths (SE and PSE) were consolidated in ENG.

**Table 3-1. Systems Engineering Workforce in the DoD
Reported by Military Department Systems Engineers and DASD(SE)**

Total Number of Civilian and Military Acquisition-ENG Personnel								
Fiscal Year	**Year Ending**	**US Army**		**US Navy**		**US Air Force**[3]		**DASD(SE)**	
FY05	30-Sep-05	11,138		16,886		6,505		13	
FY06	30-Sep-06	11,964		16,688		6,237		14	
FY07	30-Sep-07	11,050		16,804		6,162		13	
FY08	30-Sep-08	10,769		16,576		6,429		14	
FY09	30-Sep-09	10,208		18,085		7,197		13	
FY10	30-Sep-10	10,647		19,270		7,625		14	
FY11	30-Sep-11	10,071		19,325		8,514		23	
FY12	30-Sep-12	9,812		19,498		8,649		23	
FY13	30-Sep-13	9,374		19,589[4]		8,474		21	
		Planned Growth	**Projected End Strength**	**Planned Growth**	**Projected End Strength**	**Planned Growth**	**Projected End Strength**	**Planned Growth**	**Projected End Strength**
FY14	30-Sep-14	22	9,396		20,290	-74	8,400	0	20
FY15	30-Sep-15	21	9,417	106	20,396	-22	8,378	0	20
FY16	30-Sep-16	0	9,417	6	20,402	-23	8,355	0	20
FY17	30-Sep-17	0	9,417	-9	20,393	-13	8,342	0	20
FY18	30-Sep-18	0	9,417	-136	20,257	-10	8,332	0	20

Table 3-2 summarizes the systems engineering contractor workforce support delivered to the Military Departments during FY 2012. This data was reported to Congress by DoD in an effort to improve visibility into and accountability of contracted services in accordance with title 10, U.S.C, section 2330a. The Inventory of Contracts for Services reflects input from the Military Departments.[5] The data was extracted from the Inventory of Contracts for Services database using the following Product Service Codes[6, 7] to denote systems engineering effort.

- R414 (Support- Professional: Systems Engineering Services)

- R421 (Support- Professional: Technical Assistance)

- R425 (Support- Professional: Engineering/Technical)

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[3] Source: USD AT&L DataMart Q4 FY12.
[4] DON FY 2013 personnel on-board as of September 30, 2013. Source: DACM MIS.
[5] Source: Defense Procurement and Acquisition Policy (DPAP) website
http://www.acq.osd.mil/dpap/cpic/cp/acquisition_of_services_policy.html.
[6] Source: U.S. General Services Administration Office of Government-wide Policy, Federal Procurement Data
System Product and Service Codes Manual, August 2011 Edition (Effective Date: October 1, 2011), pp. 103, 217.
[7] Both R414 and R421 were end-dated and merged into PSC R425; legacy data retained effective October 2011.

Table 3-2. Systems Engineering Contractor Workforce Supporting the Military Departments as Reported by DoD to Congress

Total Number of Non-Government Systems Engineering Support Personnel (FTEs)				
Fiscal Year	Year Ending	US Army	US Navy	US Air Force
FY12	30-Sep-12	13,033	16,416	10,547

This summary reflects the latest information available as of publication of this Annual Report; FY 2013 contractor workforce data will not be provided to Congress until mid-2014 in accordance with the requirements of sections 235 and 2330a of title 10, U.S.C.

These numbers are based on product service codes and do not provide position-specific information such as acquisition job functions that might confirm that these FTEs reflect high-value systems engineering support. These numbers may also represent positions supporting Research and Development, Test and Evaluation, or other areas. In addition, selection of product service codes occurs locally at the individual contract level and may result in differing interpretation of contract work content across the Military Departments and activities. Although contractors are encouraged to parse contract task orders to reflect multiple functions (i.e., product service codes), this requirement is enforced at the local contracting activity and program level.

These numbers represent the best available approximation of the actual systems engineering contractor workforce numbers. We do not, at this time, have an estimate of the projected systems engineering contactor workforce.

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4 DASD(SE) PROGRAM ASSESSMENTS

The following sections include detailed assessments of 42 MDAPs, MAIS programs, and special interest programs that involved significant systems engineering activity in FY 2013. The assessments are organized by Military Department (Army, Navy, and Air Force) followed by DoD (joint) programs. Assessments are as of 4th quarter FY 2013.

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4.1 DASD(SE) Assessments of Army Programs

Assessments are as of 4th quarter FY 2013. This section includes summaries on the following eight programs:

- Common Infrared Countermeasure (CIRCM)
- Distributed Common Ground System–Army (DCGS-A)
- Ground Combat Vehicle (GCV)
- Guided Multiple Launch Rocket System–Alternative Warhead (GMLRS-AW)
- Improved Turbine Engine Program (ITEP)
- MQ-1C Gray Eagle Unmanned Aircraft System (UAS)
- Paladin Integrated Management (PIM)
- Warfighter Information Network–Tactical, Increment 2 (WIN-T Inc 2)

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Common Infrared Countermeasure (CIRCM)
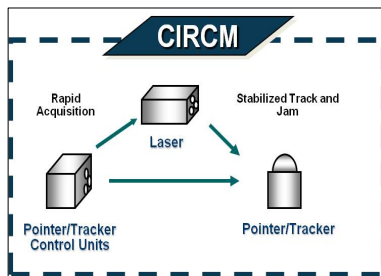
CIRCM Concept

Northrop Grumman Design

BAE Systems Design

Prime Contractor: Northrop Grumman; BAE Systems (competition)

Executive Summary: The CIRCM system replaces the Advanced Threat Infrared Countermeasure (ATIRCM) Quick Reaction Capability (QRC) with a more reliable, lighter weight, and upgradable countermeasure solution capable of meeting tri-Service rotary-wing and small fixed-wing requirements. CIRCM enhances the host aircraft's ability to survive and maneuver to engage enemy forces in all environments to support joint force mission objectives. CIRCM is in Technology Development (TD), pre-MS B. In FY 2013, DASD(SE) participated in Preliminary Design Reviews (PDR) of both contractors: Northrop Grumman in July 2013 and BAE Systems in August 2013.

Mission and System Description: CIRCM is an Army program to develop critical survivability against current and future infrared (IR) threats. Installed in a host aircraft, the CIRCM provides the ability to prevent/mitigate adverse effects of missile attacks. CIRCM provides the sole acquisition of future laser-based countermeasure systems for all rotary-wing, tilt-rotor, and small fixed-wing aircraft across the DoD. CIRCM will be integrated with a passive missile warning system, an improved countermeasures dispenser, and advanced expendables. A Modular Open Systems Approach (MOSA) provides flexibility to adapt to technology and threat evolution.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the CIRCM SEP in December 2011 to support MS A. The program is fulfilling the objectives of the SEP without waivers or deviations. The Army is updating the SEP to support MS B in 1st quarter FY 2015.
- **Requirements** – The JROC approved the Initial Capabilities Document in July 2010 and is reviewing the CDD dated June 2013. The System Performance Specification is traceable to the requirements of CIRCM and its predecessor, ATIRCM. CIRCM is required to be lighter, more reliable, and fielded on more aircraft using MOSA principles. Both contractors conducted trade studies in the areas of laser and pointer/tracker technology to reduce technical risk. Post-PDR units will be assessed during planned Government testing of both contractors' designs at the end of TD in FY 2014.
- **Life Cycle Management** – CIRCM is implementing USD(AT&L) Better Buying Power initiatives by carrying two contractors through MS B and further conducting an economic analysis to determine the possibility of continuing the competition beyond MS B. MOSA design is allowing the program to keep key elements of the pointer-tracker, laser, and processor separated to allow competitive selection during future upgrades.

Data as of 4th quarter FY 2013.

- **Program Protection Plan (PPP)** – DASD(SE) reviewed the draft PPP in April 2013 and provided comments to the program. The program is updating the PPP and will include appropriate language in the Engineering and Manufacturing Development RFP statement of work.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in separate PDRs for the two contractors competing during TD and is preparing a PDR assessment. DASD(SE) assessed the program as having a high likelihood of accomplishing its intended mission with no remedial action necessary to achieve the Acquisition Program Baseline. The program is demonstrating an advanced level of maturity for a system at PDR. One hundred percent of the design drawings have been delivered, and both contractors are delivering post-PDR hardware to the Government for further testing for score. DASD(SE) participated in a CIRCM Economic Analysis Assessment directed by USD(AT&L) to provide decision makers with the most efficient and cost-effective CIRCM Acquisition Strategy moving forward.
- **Risk Assessment** – CIRCM is executing the risk management program documented in the approved SEP. The program is managing risks associated with Defense Exportability Features, B-Kit weight, and probability of countermeasure.
- **Performance** – The program is on track to meet the KPPs and KSAs as well as the draft Technical Performance Measures (TPM) documented in the SEP by the FRP decision. The TPMs in the SEP are specific enough to provide meaningful tracking through system development and will be tailored to the specific design selected. The two contractors participating in TD conducted PDRs to assess the status of the designs. Both contractors exceeded the expected level of design for this stage in the program. Both contractors have provided five complete sets of post-PDR prototypes to the Government for upcoming Systems Integration Laboratory testing.
- **Schedule** – The program is in the TD phase. MS A occurred in 2012, and MS B is scheduled for 1st quarter FY 2015. The established schedule is executable.
- **Reliability** – The program is executing a reliability growth plan, and system reliability is projected to meet requirements by the FRP decision. The PDR assessed results of more than 1,800 hours of system-level accelerated life testing. Both contractors have made corrections through hardware, software/firmware, or process improvements. Post-PDR prototypes will be used in a Government-conducted reliability demonstration test in FY 2014. Reliability of the system is measured through mean flight hours between operational mission failure and mean time between failure. Both are estimated to favorably exceed threshold reliability requirements.
- **Software** – The Software Development Plan is adequate and is being executed. The program has met all software milestones, and both contractor software builds exceed TD phase criteria at PDR.
- **Manufacturing** – Manufacturing risks are not expected based on experience and existing production of similar components and technologies.
- **Integration** – Two contractors are competing for a single award at MS B.

Conclusion: The CIRCM program's two competing contractors successfully conducted PDRs in July and August 2013. The PDRs confirmed that the two designs are maturing ahead of the plan and met exit criteria. CIRCM will begin TD system-in-the-loop testing in FY 2014.

Data as of 4th quarter FY 2013.

Distributed Common Ground System–Army (DCGS-A)

Prime Contractor: General Dynamics Corporation Command, Control, Communications, and Computers Division in Scottsdale, AZ

Executive Summary: DCGS-A will provide the future Army intelligence framework and foundation for all intelligence operations at the Joint Task Force level and below. The program is in the Operations and Support phase. In 1st quarter FY 2013, DASD(SE) conducted a Software Focused Review to assess overall technical planning and performance. The review team noted several findings; all are on track for resolution in FY 2014.

Mission and System Description: DCGS-A is a software-intensive program integrating commercial off-the-shelf (COTS) hardware and software. The DCGS-A baseline has one increment with three major software releases: Release 1 (Secret enclave), Release 2 (Top Secret/Special Compartmented Information capabilities), and Release 3 (Thin Client Cloud Computing Capability) leveraging Intelligence Community (IC) Information Technology Enterprise (IC-ITE). Each software release will integrate additional intelligence, surveillance, and reconnaissance (ISR) capabilities that will satisfy capability gaps and emerging sensor capabilities. DCGS-A provides timely, multi-intelligence battle management and targeting information to field commanders at all echelons. DCGS-A enables users to collaboratively access, plan, task, collect, process, exploit, and disseminate threat, non-combat, terrain, and weather information.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program has an approved SEP, dated September 2011. The program is revising the SEP to address findings from the fall 2012 Focused Review in the following areas: reliability, Cloud integration, Technical Performance Measures (TPM), software scope and capability definition, and schedule management. Per the December 2012 Full Deployment Decision (FDD) Acquisition Decision Memorandum (ADM), the revised SEP is required for the remaining Increment 1 capabilities (Releases 2 and 3). Approval of the revised SEP is planned for FY 2014. The program is fulfilling the approved SEP's objectives without waivers or deviations.
- **Requirements** – The guiding requirements document is the CPD dated October 30, 2011, approved by the JROC February 3, 2012. The program's Increment 1 requirements have remained both reasonable and stable since CPD approval. These requirements were reviewed at the FY 2013 Focused Review and remain unchanged.
- **Life Cycle Management** – The program has two key cost-reduction initiatives, which will be applied over the Increment 1 life cycle: (1) The program projects cost savings over the life cycle by reducing software licensing and maintenance fees by leveraging proven COTS software applications and through stringent negotiation of Enterprise License Agreements, as applicable, for better buying power. (2) The program projects saving $571 million over the life cycle through a planned reduction in the need for on-ground support equipment at all DCGS-A sites by implementing remote access to DCGS-A systems
- **Program Protection Plan (PPP)** – The program is executing to the processes documented in the approved Increment 1 PPP, dated November 2012.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments –** DASD(SE) conducted a Focused Review in FY 2013 to inform the December 2012 FDD. The program made significant progress in addressing these findings. DASD(SE) conducted quarterly DAES assessments and found the program on track to meet its objectives in all areas except management, as the SEP is deficient in the TPM and reliability areas.
- **Risk Assessment** – The program is executing the risk management program as documented in its Risk Management Plan. The program has made significant progress in mitigating risks in the verification, reliability, and Cloud integration areas and is on track to provide the required cross-domain data sharing capability to the Warfighter on time and to provide effective ISR capability.
- **Performance** – The program is on track to meet its two KPPs (Net-Ready and fusion). In the verification effort, just before the program's FDD in December 2012, Release 2 (TS/SCI enclave) did not perform well and was deemed ineffective and unsuitable. Consequently, only the Release 1 (Secret enclave) was approved for fielding at the FDD. The program is developing a quantified portrayal of its technical maturity growth over the program's life cycle in FY 2014.
- **Schedule** – The program is on track to deliver its required capabilities by its APB Full Deployment delivery threshold date of September 2020. Release 1 is in the Operations and Support phase, following the program's December 2012 FDD. The Release 2 and 3 fielding decisions are planned for FY 2015 and FY 2016, respectively. Regarding capabilities, Release 1 is the Secret enclave, Release 2 is the TS/SCI enclave and is on track to meet its FY 2015 Fielding Decision, and Release 3 will leverage Cloud features. The program and the Army verification and certification communities are teaming to rebaseline the schedule to ensure the APB Full Deployment delivery threshold date is met.
- **Reliability** – The program's reliability is on track with its predicted software defect life cycle. DASD(SE) is working with the program to incorporate a quantified portrayal of reliability maturation over the program life cycle in FY 2014. The program remains on track with both partial and full mission-capable availability requirements (i.e., 90% and 10%) demonstrated during 3rd quarter FY 2012 IOT&E (100% and 78% based on ATEC evaluation).
- **Software** – The program is on track to develop software to meet its two KPPs. The program is improving software functional maturity and reliability. PM DCGS-A has established a risk-focused Software Quality Assurance process to conduct software code static analyses as an early measurement to assess the quality of the vendor-delivered code. This will be done prior to the software's integration into the baseline. The program holds a monthly Development Discrepancy Review Board to adjudicate software defect priorities and resolutions. It then conducts systematic software quality assurance inspections to gain insight from the trends revealed in the measurement data. This insight provides confidence that the maturity of the software development process yields the required reliability in the required operational functionality.
- **Manufacturing** – DCGS-A is a Major Automated Information System program and does not have production deliveries.
- **Integration** – The program's technical integration efforts are on track to meet program objectives. Twelve to 14 vendors provide software products to the Government, as the Government is the program integrator. The software is integrated in the Army's System Integration Laboratory at Aberdeen, Maryland. The program executes its planning effectively with the variety of external technical stakeholder organizations, according to its approved SEP. The required certification and verification activities are proceeding on plan.

Conclusion: The program is adjusting its planning, as necessary, to deliver the required cross-domain data-sharing capability by its APB delivery threshold date of September 2020. The program's Release 1 capability is fielded, supporting global operations. Release 2 is in verification and certification. Release 3 is being planned.

Data as of 4th quarter FY 2013.

Ground Combat Vehicle (GCV)

Prime Contractors: General Dynamics Land Systems; BAE Systems (competition)

Executive Summary: The GCV program is using an incremental approach to acquire a modern combat vehicle. The first increment focuses on acquiring an infantry fighting vehicle (IFV) intended to replace the Bradley IFV. The GCV IFV program is in the Technology Development (TD) phase. In FY 2013 DASD(SE) participated in updates to the Analysis of Alternatives (AoA), Systems Engineering Working Integrated Product Team meetings, Knowledge Point (KP) reviews, Program Management Reviews, and technical reviews. Based on directed funding changes to the program and knowledge gained in the first year of the TD phase, the USD(AT&L) directed a program restructure in 2nd quarter FY 2013. The program restructure incorporates an additional 6 months into the TD phase, shifts PDRs approximately 6 months, adds additional prototypes, and directs a down-select to one prime for the Engineering and Manufacturing Development (EMD) phase.

Mission and System Description: The GCV IFV will support joint forces across the full range of military operations in a wide range of terrain and environments. The GCV replaces the Bradley M2A3 IFV in the armored brigade combat team and provides mobile reconfigurable armored protection against a variety of threats. GCV IFV includes the potential for later enhancements to survivability and lethality to meet future threats. GCV IFV provides the infantry squad with highly mobile and protected transport to decisive locations on the battlefield. It provides both destructive fires against threat armored vehicles and direct fire support for the squad during dismounted assaults.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in March 2011 to support MS A. There are no approved waivers. The program did not update the MS A SEP to account for program restructuring in FY 2013, but has updated the SEP in preparation for MS B.
- **Requirements** – The Army incorporated final updates to the draft GCV CDD in September 2013. The JROC is reviewing the document for approval. The program revised the CDD based on engineering trade studies, a Non-Developmental Vehicle (NDV) assessment, KP reviews, and findings from a Configuration Steering Board to balance program risk, affordability, and operational performance. The program updated its performance specification from knowledge gained during its TD phase to align with the updated draft CDD but did not incorporate all changes into the TD phase contract by the end of FY 2013.
- **Life Cycle Management** – The program has actively tracked projected system life cycle costs in the TD phase to support better buying power for the DoD. Both vendors have an average unit manufacturing cost requirement to meet, while managing Technical Performance Measures for mean time to repair, operations and support costs, and energy efficiency. Design activities of the vendors included sustainability and maintainability considerations balanced with affordability.
- **Program Protection Plan (PPP)** – GCV does not have an approved PPP, but both TD phase contractors have developed Program Protection Implementation Plans based on a draft PPP. The approval of the PPP will support MS B.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted no formal assessments in FY 2013 because a program restructure in 2nd quarter FY 2013 delayed planned Preliminary Design Reviews (PDR). DASD(SE) plans PDR assessments in FY 2014 after the vendors complete their PDRs.
- **Risk Assessment** – The program's risk management process is documented in the SEP and in contractor Risk Management Plans. The program's restructure reduced overall program risk by extending the TD phase by 6 months and the overall program schedule by 18 months. Both contractors added risk reduction activities such as automotive and turret assets to the TD phase to reduce integration risks in mobility and lethality. The additional efforts will result in demonstration of the GCV primary armament fire control and mobility subsystems, reducing risks prior to MS B.
- **Performance** – Pending PDR assessments, the program is on track to meet its nine proposed KPPs with no greater than moderate risk. The program is planning analysis and verification events before MS B, including risk reduction efforts in mobility and lethality added to the TD phase during FY 2013.
- **Schedule** – The program entered the TD phase with a MS A decision in July 2011. MS B is planned for 3rd quarter FY 2014 after a FY 2013 program restructure added 6 months to the TD phase. The first production IFV is expected to be delivered for testing in 2d quarter FY 2020, 18 months later than the original plan. TD phase analysis and review informed the adjustments.
- **Reliability** – The program lowered its reliability requirement by 29 percent to 220 hours mean time between system abort (MTBSA) after comparative analysis of existing Bradley IFV performance and operational needs. The revised MTBSA represents a 47 percent improvement over the Bradley. DASD(SE) is continuing to assess reliability growth planning and impacts on Operations and Support resourcing to support MS B.
- **Software** – Both competing contractors employ iterative development approaches that break software requirements implementation into several cycles and are reporting source lines of code developed during the TD phase with any associated problem reports. DASD(SE) identified software safety criticality concerns, which the program is correcting. The program expects to verify these corrections in conjunction with PDR in FY 2014 and reviews following the PDR. The program is on track with its TD phase software development for approximately 400,000 source lines of code, which comprises approximately 50 percent of the total planned software effort.
- **Manufacturing** – GCV manufacturing development is progressing according to plans in the approved SEP. DASD(SE) is working with the program to include a manufacturing assessment in its PDR assessment in FY 2014.
- **Integration** – The TD phase contractors have developed system-level integration plans and Interface Control Documents in preparation for the integration, assembly, test, and checkout of the system prototypes in the EMD phase. The GCV program is managing external dependencies on other programs and has established memoranda of agreement with the external programs. The program has developed an initial synchronization schedule in preparation for MS B. Both TD phase contractors have system integration labs in which software is loaded on surrogate or actual hardware and operated in simulated system environments.

Conclusion: The Army's exploration of the capabilities trade-space and full range of alternatives prior to finalizing requirements, led to a modified set of requirements that required updates to the preliminary design. The combination of fiscal pressures and the need for additional development time led to a restructured program extending the TD phase. The extension allows design updates and the addition of risk reduction assets to reduce integration risk before making a competitive down-select to one prime contractor for EMD. The program is meeting its objectives for the TD phase.

Data as of 4th quarter FY 2013.

Guided Multiple Launch Rocket System–Alternative Warhead (GMLRS-AW)

Prime Contractor: Lockheed Martin, Missiles and Fire Control Systems

Executive Summary: The GMLRS-AW is a precision strike artillery rocket system with the mission to attack area and imprecisely located targets at short, medium, and long ranges in all-weather environments. GMLRS-AW is in the Engineering and Manufacturing Development (EMD) phase. DASD(SE) prepared a Critical Design Review (CDR) assessment during FY 2013.
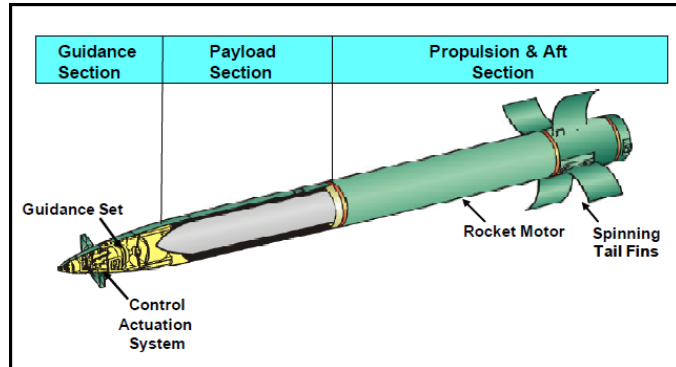
Mission and System Description: The GMLRS-AW is a precision-strike artillery rocket system with the mission to attack area and imprecisely located targets at short, medium, and long ranges in all-weather environments. Targets include counterfire, air defense, command and control, and other high-payoff targets at all depths of the tactical battlefield. The rocket uses a solid propellant and is fired from the M270A1 Multiple Launch Rocket System and the M142 High Mobility Artillery Rocket System mobile launch vehicles. The rocket uses an Inertial Measuring Unit (IMU) with Global Positioning System (GPS) assistance to guide the rocket to a specific point and deliver effects on a target. GMLRS-AW is designed to attack the same target set as the GMLRS Dual-Purpose Improved Conventional Munition at the same ranges but eliminates the probability of unexploded ordnance, to satisfy DoD policy.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the GMLRS-AW SEP in November 2011. The program office completed a SEP update in September 2013 that reflects an update to the Acquisition Strategy combining FRP with MS C. The program office coordinated this update with DASD(SE). The program is executing the processes documented in the approved SEP in an event-driven manner. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the GMLRS-AW CDD in November 2011 as the third increment of GMLRS rockets. Program requirements are reasonable and stable. CDD requirements trace to subsystem performance specifications. The initial product baseline is established and consists of product drawings, item specifications, special inspection equipment, and special tooling.
- **Life Cycle Management** – Because production processes with the GMLRS-AW rocket are 95 percent common with the current Unitary rocket, the program office combined the FRP decision with the MS C decision planned for May 2015. This move accelerates Initial Operational Capability by 7 months and reduces testing required to support the program. The updated Acquisition Strategy reflects the program office's examination of cost-reduction initiatives in an effort to drive productivity growth through should-cost management. The program is leveraging GMLRS-Unitary hardware commonality to reduce required testing and a shared production line to eliminate the need for a formal LRIP phase.

Data as of 4th quarter FY 2013.

- **Program Protection Plan (PPP)** – Program Executive Office (PEO) Missiles and Space approved the program's abbreviated PPP in July 2011. The program will update the PPP for the combined MS C/FRP decision review. The program is executing the processes documented in the abbreviated PPP.

Assessments
- **DASD(SE) Assessments** – DASD(SE) prepared a CDR assessment after the program's system CDR in July 2013. The PEO requested DASD(SE) conduct the assessment. The assessment determined that the design is projected to meet all KPPs, KSAs, and Technical Performance Measures (TPM) as documented in the SEP; the initial product baseline has been established and is under configuration control; and the program had no high technical risks at the time of the review. No new risks or issues were identified during the CDR.
  - o DASD(SE) prepared four quarterly Defense Acquisition Executive Summary assessments for the GMLRS program in FY 2013, addressing schedule, performance, management, interoperability, and production.
  - o DASD(SE) plans to monitor the program's production readiness and Physical Configuration Audit activities in FY 2014.
- **Risk Assessment** – The program is executing its risk management program documented in the Risk Management Plan. The program is working to mitigate risks in the launcher software integration and production readiness areas for FRP.
- **Performance** – The GMLRS-AW CDR assessment indicated that the program is on track to meet its KPPs, KSAs, and TPMs by the Initial Operational Test and Evaluation (IOT&E) in November 2014.
- **Schedule** – The GMLRS-AW program completed MS B in February 2012. The program conducted the GMLRS-AW System CDR in July 2013, 3 months after the April date in the approved SEP. The program required a successful engineering development flight test before the System CDR, which it achieved in April 2013. An issue with warhead fuze retention contributed to the delay in the System CDR, but the program resolved the issue ahead of the CDR.
- **Reliability** – Reliability is maturing in accordance with the reliability growth plan, and the system is projected to meet CDD reliability requirements by IOT&E.
- **Software** – At CDR, the contractor presented software development as being on track for completion by March 2014 to support formal qualification testing and further flight testing. Software requirements are under configuration control.
- **Manufacturing** – GMLRS-AW manufacturing development is progressing according to plans documented in the approved SEP. The contractor completed all 29 planned warhead Production Line Validations (PLV) for developmental test articles during FY 2013, verifying production processes, tooling, documentation, and support elements within the intended manufacturing facilities.
- **Integration** – The GMLRS-AW mechanical and electrical interfaces with the rocket are the same as those for the GMLRS-Unitary rocket already in production. All GMLRS-AW hardware and software interfaces are defined by Interface Control Documents. The alternative warhead was designed to fit within the fixed dimensions of the GMLRS rocket's warhead space. The program is executing plans with external technical organizations and programs as outlined in the approved SEP and is on track to complete all necessary memoranda of agreement ahead of the May 2015 MS C. Integration and test are proceeding as planned and are on track to proceed in FY 2014.

Conclusion: The GMLRS-AW program successfully completed its CDR in FY 2013 and is on track for a combined MS C/FRP in May 2015.

Data as of 4th quarter FY 2013.

Improved Turbine Engine Program (ITEP)

Prime Contractor: To be determined (pre-RFP release)

Executive Summary: ITEP is a pre-MS A program to build the Improved Turbine Engine (ITE), a centerline 3,000 shaft horsepower (shp) turboshaft engine that will replace current 2,000 shp T700-GE-701D engines in Army H-60 and AH-64 helicopters. The ITE is planned to comply with the size constraints of the -701D engine at similar weight and will provide significant fuel savings, increased range and endurance, and a power enhancement. The ITE also will serve as an engine "bridge" to support the Future Vertical Lift initiative. DASD(SE) contributed technical input to the Analysis of Alternatives (AoA) study guidance, the AoA Study Plan, a Study Advisory Group meeting, and during the AoA Risk Workshops.
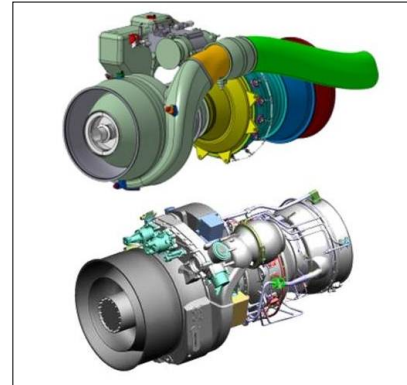
Mission and System Description: The current T700 engine does not provide the power necessary to meet the growing demands placed on fielded helicopters. A more powerful and efficient engine is required to address deficiencies in mission performance resulting from aircraft weight growth and operating in harsher environments, and to improve fuel consumption. The ITE will incorporate technology advances to bridge capability gaps identified in the Operational Energy Initial Capabilities Document and the Army Aviation Capabilities-Based Assessment. It will meet operational requirements worldwide (6,000-foot altitude, 95 degrees F) and will provide improved fuel efficiency and increased operational trade space. The program will build on the Army's Advanced Affordable Turbine Engine (AATE) Science and Technology (S&T) effort. AATE partially funded two contractors through cost-sharing agreements to demonstrate full-scale engines that achieved significant reductions in fuel consumption, maintenance costs, and production costs while increasing horsepower-to-weight ratio and engine design life. The new technologies developed during AATE will form the basis of the ITE.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The program office submitted a draft SEP for review. DASD(SE) provided initial comments, which the program is incorporating into an update. The SEP is on track for approval to support MS A. No waivers or deviations are expected.
- **Requirements** – The Army is preparing a draft CDD to support MS A. The program has mapped planned requirements into a Specification Development Document and a System Requirements Document and has incorporated comments from the Army's airworthiness certification organization. The program also has developed a draft Performance Work Statement that maps to the requirements and specification documents.
- **Life Cycle Management** – The primary program goals include significant reductions of production costs, maintenance costs, and fuel consumption, as well as increased engine design life. The basis for comparison is the currently fielded -701D engine. The program and the AoA study team are quantifying the expected reductions in life cycle costs by analyzing the performance demonstrated by the AATE engines and the improvements that can realistically be expected during ITE development.

Data as of 4th quarter FY 2013.

- **Program Protection Plan (PPP)** – DASD(SE) completed an initial review of the draft MS A PPP. The program is incorporating DASD(SE) comments. The program expects to obtain PPP approval by MS A.

Assessments
- **DASD(SE) Assessments** – DASD(SE) contributed to the AoA study guidance and AoA Study Plan. DASD(SE) participated in the OIPT and Materiel Development Decision DAB in September and October 2012, an interim OSD Study Advisory Group meeting in April 2013, and program working group meetings. DASD(SE) expanded the AoA guidance and AoA Study Plan to include an analysis of the current rotary wing fleet and what aircraft integration and modification efforts would be required to capitalize on the ITE performance improvements. As a result, aircraft integration efforts are a central focus of the AoA and will be addressed in detail in the final AoA Study Report. DASD(SE) contributed risk management expertise to the ITEP Risk Workshop in May 2013, which resulted in a detailed assessment of program risks and mitigation strategies to inform the AoA and program schedule.
- **Risk Assessment** – The program has conducted technology, manufacturing, and integration readiness assessments and has used the results to develop program risks. The program is managing risks related to new technologies that are central to the targeted ITE performance gains. The program is using AATE demonstrations and the Technology Development Strategy to quantify cost, schedule, and performance risks, develop off-ramps, and assess program implications. Known technology risks and their implications are well understood.
- **Performance** – ITEP is leveraging AATE to establish realistic performance thresholds to be included in the CDD. The program conducted a 2-day performance Trades Study in August 2013. Trades in schedule and performance may be necessary if program goals change or cannot be achieved. The program and the AoA study team are using the trade study results to inform the AoA, program schedule, Technology Development Strategy, and CDD.
- **Schedule** – MS A for the ITEP has been delayed, primarily because of funding uncertainty. The program is using the delay to provide more detail to the AoA and to establish benchmarks that will support development of a realistic, achievable schedule once funding levels are known.
- **Reliability** – The program is completing a Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report to establish program reliability requirements. The RAM-C Report will be used to inform the CDD and to support contracting activities.
- **Software** – The ITE will incorporate a software-intensive full-authority digital engine control (FADEC) that will be developed by the contractor(s). The program is developing a strategy for data rights and protection of the FADEC software and hardware.
- **Manufacturing** – The program is pre-source selection. The program and the AoA study team conducted an early manufacturing risk assessment at the AoA Risk Workshop and discussed manufacturing trades during the Trades Study. Both primary candidate contractors are proposing new technologies that present some manufacturing risk. The program is developing off-ramps and analyzing the implications of realizing the identified risks.
- **Integration** – ITEP resides within the Army's Utility Helicopters program office, which has a close working relationship with H-60 stakeholders, including the Navy and Air Force. The program is keeping AH-64 stakeholders informed of program developments and has established a memorandum of agreement with the AH-64 program office.

Conclusion: The ITEP is leveraging prior S&T efforts to conduct a thorough AoA and establish a realistic, relevant, achievable program. The program has analyzed cost, schedule, and performance risks and is emphasizing proactive risk management.

Data as of 4th quarter FY 2013.

MQ-1C Gray Eagle Unmanned Aircraft System (UAS)

Prime Contractor: General Atomics Aeronautical Systems Incorporated (GA-ASI)

Executive Summary: Gray Eagle is a medium-altitude, long-endurance UAS providing multiple sensor and weapons capabilities. The program is in the Production and Deployment (P&D) phase and is simultaneously integrating new capabilities and supporting deployed operations. DASD(SE) conducted reliability engineering and software assessments in 2013 to support the program's ongoing effort to improve reliability and software processes. The program achieved its FRP milestone in June 2013.

Mission and System Description: The system executes reconnaissance, surveillance, security, targeting, attack, and command and control missions to provide dedicated mission-configured UAS support to Army and joint force units based upon the division commander's mission priorities. The Gray Eagle is weapons-capable and equipped with Synthetic Aperture Radar (SAR) and electro-optical/infrared/target designation payloads, Ground Control Stations (GCS), Tactical Common Data Links, satellite communications, and other support equipment.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in May 2010 to support MS C. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the CPD in March 2009. The Army submitted a revised CPD in May 2013. The revision includes balanced subsystem Reliability KSA requirements that support the Sustainment KPP. The program's strategy to incrementally add capability, including the effort to integrate the Universal GCS (UGCS) prior to Follow-on Operational Test and Evaluation (FOT&E), presents an ongoing requirements management challenge. The program is managing capability additions through prioritization and the use of branch or parallel efforts to avoid disrupting the program of record.
- **Life Cycle Management** – Independent research and development resources have focused on initiatives that reduce life cycle cost. The Gray Eagle program is leveraging elements of the Shadow UAS development effort that are common to both systems and projects a cost avoidance of approximately $58 million.
- **Program Protection Plan (PPP)** – The USD(AT&L) approved the Gray Eagle PPP in April 2013. The program is executing the processes documented in the approved PPP.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a Software Focused Review in December 2012. Software processes have improved since the last detailed software assessment in FY 2009, but further improvements are necessary. DASD(SE) working groups also assessed the program's reliability improvement initiatives and system performance.
  - The DASD(SE) Software Focused Review included a parametric schedule analysis, which indicated a risk to delivering sufficiently mature FOT&E software within the time available. The program has mitigated the risk by reducing the capability set for FOT&E and is working to improve software processes and to develop a comprehensive software metrics program.

Data as of 4th quarter FY 2013.

- o Subsystem reliability has improved and is sufficient to support the program's Sustainment KPP. Improvements are needed to reduce total ownership cost, ease operator burden, and provide margin for meeting operational availability requirements across all mission threads. A reliability growth program is under way, and the program has an approved growth curve.
- o In FY 2014 DASD(SE) will assist the program in establishing a comprehensive software metrics program to enable improved software development planning and execution.

- **Risk Assessment** – The program is executing the risk management program documented in the SEP and is working to mitigate risks in the software process, requirements management, and subsystem reliability areas.

- **Performance** – The program has seven KPPs, six of which were demonstrated before FRP. The program did not meet the Net-Ready KPP because of a delay in Link 16 integration related to the Army communications infrastructure. Before FRP, the Army deferred Link 16 until FOT&E.

- **Schedule** – The program completed an FRP DAB in June 2013. The program met all March 2012 Acquisition Program Baseline (APB) thresholds through FRP and is on track to meet the thresholds established in the FRP APB update, approved in September 2013. The APB update reflects a change in the FOT&E threshold date from February 2014 to November 2015. The 21-month delay resulted from a requirement to integrate the UGCS before FOT&E and from software development issues. The program is revising software processes and is managing development schedule risk to meet the FOT&E target.

- **Reliability** – The program is on track to meet the proposed CPD KSA requirements for subsystem reliability at FOT&E. Current system reliability is maturing in accordance with revised reliability growth curves based on the new requirements. UGCS integration increases the risk of meeting the new reliability requirements at FOT&E.

- **Software** – The program continues to address software process deficiencies, manage FOT&E software development schedule risk, and develop a software metrics program. The program had planned to conduct FOT&E using the One System GCS but is now required to integrate the UGCS before FOT&E. Subsequent to the December 2012 Software Focused Review, the program reduced the capability set for the FOT&E software build to reduce schedule risk. The program is currently supporting a single fielded software release.

- **Manufacturing** – The contractor continues to deliver LRIP aircraft on schedule and is on track to meet a production increase from the current 24 aircraft per year to 29 per year for LRIP II and III. Production capacity is 3 aircraft per month and can surge to 5 per month with minor retooling. An FRP decision occurred in June 2013. The FRP rate is 15 aircraft per year. The three LRIP increments authorized procurement of 103 aircraft, and FRP authorized up to 49 aircraft.

- **Integration** – Link 16 integration is the most significant remaining requirement to satisfy the Net-Ready KPP. The requirement has previously been deferred because of an incomplete Army communications infrastructure, but the program plans to complete Joint Interoperability Test Command Link 16 certification in 1st quarter FY 2014. The program completed developmental test efforts in July and August as risk mitigation and is on track to demonstrate the Net-Ready KPP before FOT&E. Integration of the UGCS is under way and will be demonstrated at FOT&E.

Conclusion: The Gray Eagle program continues to provide effective support to the Warfighter as a proven combat multiplier and to make progress toward fielding the Block 1 configuration. User requests for additional capability are an ongoing challenge, but the program is managing the requests through prioritization and branch development efforts. Software development processes and subsystem reliability need to continue to improve as the system adds capability.

Data as of 4th quarter FY 2013.

Paladin Integrated Management (PIM)

Prime Contractor: BAE Systems

Executive Summary: The PIM program upgrades the Army's current M109 Paladin and M992A2 Field Artillery Ammunition Support Vehicle to address system platform limitations, sustainment challenges, and obsolescence issues. PIM provides increased force protection, survivability, mobility, growth margin, and commonality. PIM is in the Engineering and Manufacturing Development (EMD) phase. DASD(SE) FY 2013 activities included participation in the program Production Readiness Reviews, a Software Focused Review, and two Program Management Reviews.

Mission and System Description: The mission of the PIM system is to destroy, neutralize, or suppress the enemy by indirect fire. PIM will be assigned to Army armored brigade combat teams and fires battalions. PIM will provide offensive and defensive fires to supported forces. The PIM howitzer is an aluminum-armored, full-tracked 155-millimeter Self-Propelled Howitzer (SPH) operated by a crew of four. The SPH includes a roof-mounted .50-caliber M2 machine gun or 40-millimeter MK19 grenade machine gun. The PIM Carrier, Ammunition Tracked (CAT), a self-propelled companion vehicle, supplies the SPH with ammunition.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2012 to support the program's technical planning for EMD phase systems engineering activities. The program is executing the processes documented in the SEP. The program is fulfilling the objectives of the SEP without waivers or deviations. The program has submitted an updated SEP for review in support of the October 2013 MS C decision review.
- **Requirements** – The JROC approved the PIM CPD in December 2011. The CPD contains 10 KPPs and 8 KSAs for the PIM platforms. The CPD requirements are reasonable and stable. The CPD requirements trace to the performance specifications.
- **Life Cycle Management** –The program is using reliability incentives to enhance affordability during deployment, and plans to use cost incentives in the production contract.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PIM PPP in September 2013 in support of the October 2013 MS C. The program is executing the processes documented in the approved PPP.

Assessments
- **DASD(SE) Assessments** – DASD(SE) conducted a Software Focused Review in FY 2013 to augment the FY 2012 Program Support Review in support of MS C. The focused review revealed that the program has adequate software staff, makes use of requirements trade space to plan for potential off-ramps in development, and effectively manages risks and issues. Concurrency in the development plan is a management challenge. The program is implementing recommendations to clarify and address information assurance requirements and to manage concurrency in the compressed development schedule.

Data as of 4th quarter FY 2013.

- o DASD(SE) prepared and submitted four quarterly Defense Acquisition Executive Summary (DAES) assessments for the PIM program in FY 2013, addressing schedule, performance, management, interoperability, and production. DASD(SE) also supported the OUSD(AT&L) DAES review of PIM in November 2012.
- o DASD(SE) plans to monitor the program's Physical Configuration Audit activities as they progress from the latter part of FY 2014 to completion in 4th quarter FY 2015.
- **Risk Assessment** – The program is executing its risk management program documented in the Risk Management Plan and SEP. The program office is working to reduce a risk that the planned engine will not be available for production. The program is managing risks related to the Net-Ready, Force Protection, Survivability, and maximum rate-of-fire KPPs.
- **Performance** – The PIM program has met 4 of 10 KPPs and 5 of 8 KSAs. The program plans closure on 4 of the remaining KPPs and 2 of the 3 remaining KSAs by Initial Operational Test and Evaluation (IOT&E) in 4th quarter FY 2016. The SPH and CAT Availability KPPs and the Ownership Cost KSA will require time beyond FRP to collect data. The program is expected to meet the 29 Technical Performance Measures documented in the SEP by FRP.
  - o The program is coordinating with the information assurance stakeholders to ensure planned verification will meet requirements and support meeting the Net-Ready KPP. Vulnerability and penetration testing is planned for FY 2014 and during IOT&E in FY 2016.
  - o Vulnerabilities to certain threats at specific areas on the vehicles hindered achievement of the Force Protection and Survivability KPPs. The program is making corrections that it will verify with live-fire testing scheduled for FY 2015.
  - o The SPH has not consistently met the maximum-rate-of-fire KPP. The program has modified hardware, software, and training, and plans to verify this KPP during testing in 4th quarter FY 2015.
- **Schedule** – The scheduled October 2013 MS C date is a slip from the June 2013 date in the SEP but it is ahead of the December 2013 Acquisition Program Baseline (APB) threshold. The program is planning for First Production Delivery date in March 2015, 9 months ahead of the APB schedule threshold date of December 2015.
- **Reliability** – PIM reliability is maturing in accordance with the reliability growth curve, and the program is on track to meet reliability requirements for both platforms by the FRP decision. Reliability scoring from the FY 2013 user test showed the SPH demonstrated 124 percent of its planned reliability growth. The ammunition carrier demonstrated 107 percent of its reliability requirement.
- **Software** – The production build of software is in development with no critical trouble reports. Software development is slightly lagging its development plan, with approximately 60 percent of build complete at the end of FY 2013. Formal qualification testing is on track to start in 4th quarter FY 2014. Resource utilization remains below the 50 percent threshold except for two subassemblies. The program projects these subassemblies will retain sufficient margin to support any changes until obsolescence drives redesign. Software requirements are stable.
- **Manufacturing** – The January 2013 Production Readiness Review concluded that the program met the exit criteria as identified in the approved SEP and has closed all actions. The program is executing the manufacturing plans documented in the approved SEP.
- **Integration** – The program is on track to complete all required memoranda of agreement as outlined in the SEP within required timelines. The program is executing integration and testing plans with external technical organizations and programs as outlined in the approved SEP.

Conclusion: The program is on track for MS C.

Data as of 4th quarter FY 2013.

Warfighter Information Network–Tactical, Increment 2 (WIN-T Inc 2)

Prime Contractor: General Dynamics

Executive Summary: WIN-T is the Army's high-speed and high-capacity communications network. The WIN-T Inc 2 program is the second of four planned WIN-T increments and provides an initial on-the-move communications capability. In September 2013, the Army rescinded its FRP request because of reliability and complexity issues, and the USD(AT&L) authorized the program to extend LRIP to address the issues. DASD(SE) assisted the program with reliability growth planning.

Source: PM WIN-T Increment 2.
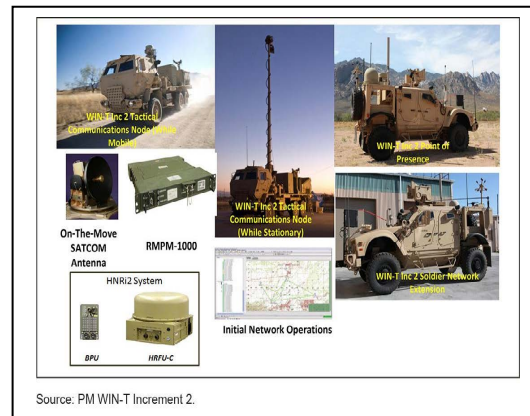
Mission and Description: WIN-T Inc 2 provides mobile tactical network communications from maneuver companies, battalions, brigade combat teams, and divisions to the operational portion of the Global Information Grid. WIN-T Inc 2 provides the Warfighter with an initial on-the-move communications capability, including both commercial and military band satellite communications and terrestrial communications. It supports limited collaboration and mission planning and enables distribution of information via voice, data, and real-time video from ground-to-ground and ground-to-satellite communications. It capitalizes on mature commercial off-the-shelf/Government off-the-shelf technologies. WIN-T Inc 2 operates in the tactical domain at the Secret level by extending the Secure Internet Protocol Router Network and at the unclassified level by extending the Non-classified Internet Protocol Router Network. WIN-T Inc 2 includes several configuration items, including Tactical Communication Nodes (TCN), Points of Presence (PoP), Soldier Network Extensions (SNE), Vehicle Wireless Packages (VWP), Network Operations and Security Centers (NOSC), and Tactical Relay-Towers (TR-T). WIN-T Inc 3 mature technologies will be inserted into Inc 2 units.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the WIN-T Inc 2 SEP in August 2009 to support MS C. The program has met the SEP requirements except for availability for the PoP configuration item and maintainability for four of six configuration items. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the WIN-T Inc 2 CPD in November 2008. The JROC approved a CPD update in August 2013 that granted the Army relief from the Force Protection KPP, so the total number of KPPs was reduced from five to four: Net-Ready, network management, information dissemination, and mobile throughput. In May 2013, the Army revised two of the four KSAs to reflect a change in the availability metric and a more realistic reliability threshold. The CPD requirements are reasonable, and the program has an adequate trace of CPD requirements to the performance specification.
- **Life Cycle Management** – The program implemented the following cost-reduction initiatives: (1) imposed firm prices and quantity lot discounts that reduced the Inc 2 total program baseline by $223 million and (2) imposed firm prices for Year 3 units with an extended warranty, which resulted in a $14 million savings. The program has initiated efforts to control costs throughout the product life cycle by implementing regional contractor field services, as opposed to having individual representatives on site, which provides a projected savings of $281 million.

Data as of 4th quarter FY 2013.

- **Program Protection Plan (PPP)** – USD(AT&L) approved the WIN-T PPP in October 2012. The PPP is sufficient to meet protection requirements and will be updated to reflect configuration obsolescence.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed Defense Acquisition Executive Summary assessments in FY 2013 and assisted the program office with improving reliability growth planning to support a September 2013 DAB. Results from previous testing showed that the program lacked adequate reliability growth. DASD(SE) assisted the program office in developing reliability growth curves and tracked results in two reliability test events. USD(AT&L) approved the reliability growth curves in April 2013, and the program demonstrated improved reliability by meeting the reliability requirement for four of six configuration items during the Follow-on Operational Test and Evaluation (FOT&E) in May 2013. Despite the overall improvements, the reliability and complexity problems for two configuration items prevented the program from achieving an FRP decision in September 2013.
- **Risk Assessment** – The program's Risk Management Plan is current and adequate. The program is managing reliability and complexity risks from the FOT&E in May 2013.
- **Performance** – The FOT&E focused on three areas: reliability, availability, and maintainability (RAM); SNE terminal performance and operational complexity; and Highband Networking Waveform performance. The program met all four KPPs but did not meet two of four KSAs during the FOT&E. Subsequent reliability growth projections met expectations at the FOT&E.
- **Schedule** – WIN-T Inc 2 received a third LRIP decision and authority to field Lot 3 items in September 2013. The first unit was equipped with WIN-T Inc 2 in 1st quarter FY 2013, and the Army achieved Initial Operational Capability with WIN-T Inc 2 in 4th quarter FY 2013.
- **Reliability** – The September 2012 Acquisition Decision Memorandum required reliability growth curves for each configuration item. USD(AT&L) approved reliability growth curves in April 2013, and the program used the curves to track reliability growth and demonstrate reliability during the FOT&E. The program met the KSA requirement for operational availability for all configuration items except the SNE, which was 98 percent of requirement. The program did not meet the KSA requirement for mean time to repair for two of five configuration items: PoP and SNE met only 86 and 61 percent of requirement, respectively (NOSC and TR-T had no failures and TCN met the requirement). There is no system-level RAM requirement, due to usage differences for each configuration item, but RAM requirements have been established for five KSA and three non-KSA configuration items.
- **Software** – WIN-T Inc 2 software development (about 1.3 million lines of code) has been stable, with no significant deficiencies. The program made minor improvements in software following the IOT&E in May 2012. No major software inserts are planned.
- **Manufacturing** – Manufacturing processes are stable with no risks. The program achieved FRP rates during the first LRIP in 2011.
- **Integration** – WIN-T Inc 2 demonstrated integration with current radios, select platforms, the Global Information Grid, and other communications networking equipment during the FOT&E and Network Integration Evaluations, which are the Army's premier communications demonstrations, conducted twice a year at White Sands Missile Range and Fort Bliss. User complexity has presented a challenge.

Conclusion: Due to issues with reliability and complexity, the WIN-T program did not proceed to its FRP decision in September 2013. Another year of LRIP has been authorized while the Army resolves reliability and complexity issues.

Data as of 4th quarter FY 2013.

4.2 DASD(SE) Assessments of Navy Programs

Assessments are as of 4th quarter FY 2013. This section includes summaries on the following 20 programs:

- Air and Missile Defense Radar (AMDR)
- CH-53K Heavy Lift Replacement Helicopter
- Consolidated Afloat Networks and Enterprise Services (CANES)
- E-2D Advanced Hawkeye Aircraft (E-2D AHE)
- Global Combat Support System–Marine Corps/Logistics Chain Management, Increment 1 (GCSS-MC/LCM Inc 1)
- Littoral Combat Ship (LCS) Seaframe
- Littoral Combat Ship Mission Modules (LCS MM)
- Mobile User Objective System (MUOS)
- MQ-4C Triton Unmanned Aircraft System (UAS)
- Next Generation Enterprise Network, Increment 1 (NGEN Inc 1)
- Next Generation Jammer (NGJ)
- OHIO Class Submarine Replacement (OHIO Replacement)
- P-8A Poseidon
- Presidential Helicopter Fleet Replacement (VXX)
- Remote Minehunting System (RMS)
- Ship to Shore Connector (SSC)
- SSN 774 VIRGINIA Class Submarine (VCS)
- Standard Missile-6 (SM-6)
- T-AO(X) Fleet Replenishment Oiler
- Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS)

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Air and Missile Defense Radar (AMDR)

Prime Contractor: Raytheon Co., Integrated Defense Systems

Executive Summary: AMDR is the Navy's next-generation radar system addressing the ballistic missile defense (BMD) and air defense (AD) capability gaps identified in the Maritime Air and Missile Defense of Joint Forces Initial Capabilities Document (MAMDJF ICD). The program has completed competitive prototyping and completed MS B in September 2013. DASD(SE) completed a Program Support Review (PSR) in November 2012 and worked with the program to implement the PSR findings during FY 2013.

Mission and System Description: AMDR will provide simultaneous sensor support of BMD and AD missions with ancillary support of surface warfare and anti-submarine warfare missions. The AMDR suite consists of S-band radar (AMDR-S), X-band radar, and a Radar Suite Controller (RSC). AMDR-S is a new development-phased array radar providing improved sensitivity for long-range detection and engagement of advanced threats. Initial ship sets will use the AN/SPQ-9B X-band radar currently in production. The RSC provides S- and X-band radar resource management and interface to the Aegis Combat System (CS).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the AMDR SEP in March 2013 to support MS B. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the AMDR CDD in May 2013. The Navy developed the AMDR CDD in coordination with the DDG 51 Flight III CDD, to inform detailed CS requirements development. The requirements are reasonable and stable. The CDD requirements are traceable to the AMDR top-level requirements. The contractor traced the AMDR top-level requirements to the system specifications and configuration item specifications. AMDR is projected to fulfill key requirements related to multimission capability and improvement in sensitivity over the existing AN/SPY-1 radar.
- **Life Cycle Management** – AMDR will be supported by the same Navy logistics infrastructure network that provides product support to current fleet radars and DDG 51 Class ships. The contractor demonstrated key features in its design to improve the ease of maintenance and reduce sustainment costs. The program implemented a reduced power mode requirement to reduce power consumption when appropriate.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in April 2013 for MS B. The program is fulfilling the objectives of the PPP without waivers or deviations.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed a PSR in November 2012. The PSR assessed the program's readiness to proceed to the Engineering and Manufacturing Development (EMD) phase. The PSR found the program has executed an effective and comprehensive Technology Development (TD) phase, demonstrating the critical technologies needed for a scalable

multimission active array radar. DASD(SE) recommended that the program strengthen program planning and conduct schedule risk assessments before contract award. The program has implemented those recommendations.

- **Risk Assessment** – The program is executing its risk management program documented in the Risk Management Plan and SEP. The program is working to mitigate risks in the ship integration, ballistic missile discrimination, spectrum allocation, and software development areas.
- **Performance** – The design and performance analysis presented by the contractor during its Preliminary Design Review (PDR) indicated that the six KPPs and nine KSAs will be achieved during the EMD phase. The contractor has developed Technical Performance Measures to track progress toward meeting the KPPs and KSAs during the EMD phase.
- **Schedule** – The program achieved MS B and was authorized entry to EMD phase in October 2013. MS B and contract award were delayed by 5 months for the program to complete source selection activities. This delay will result in a slip to the Systems Engineering Technical Review dates in the approved SEP. The revised schedule supports delivery of AMDR to the first DDG-51 Flight III ship. The delta System PDR is planned for FY 2014. USD(AT&L) approved the Acquisition Program Baseline in October 2013.
- **Reliability** – Reliability requirements are based on the AMDR CDD. The Reliability, Availability, Maintainability, and Cost (RAM-C) Report provides mission justification for the reliability and availability requirements. The program is using reliability growth curves to track software end items and the mean time between failure of line-replaceable units. During the TD phase, the contractor conducted reliability demonstrations that provided confidence the reliability requirements can be met.
- **Software** – The program has determined high-level functionality for the system. The contractor has provided preliminary software architectures and a Software Development Plan. Specific software implementation details will be presented at the delta PDR. The primary program focus in the TD phase was maturing hardware technology. DASD(SE) recommended the program strengthen the software team and update the software baseline for the EMD phase. The program accepted those recommendations.
- **Manufacturing** – The program has determined that the U.S. technology and industrial base is adequate to develop, produce, and support the AMDR. The program will execute the manufacturing guidance in the approved SEP.
- **Integration** – DASD(SE) previously identified risk in the integration of the AMDR, ship, and CS. The program is ensuring close coordination and planning with associated program offices, and leading CS Interface and Radar Ship Integration Working Groups. The program has developed an Interface Functional Document for coordination with the CS and an Interface Requirements Document for coordination with ship systems. The programs have planned a series of Interim Program Reviews to validate the AMDR-CS architecture and external logical interface requirements before each AMDR technical review. The program is working with other stakeholders to support demonstration of the AMDR to CS interfaces before the planned LRIP decision in FY 2017. This effort will include the development of Combat System Interface Support Equipment.

Conclusion: The AMDR program is on track to execute the EMD phase of development.

Data as of 4th quarter FY 2013.

CH-53K Heavy Lift Replacement Helicopter

Prime Contractor: Sikorsky Aircraft Corporation

Executive Summary: The CH-53K will provide an improved U.S. Marine Corps heavy-lift capability. The CH-53K program, consisting of 196 production aircraft, is a build-new, evolutionary update of the CH-53E design that meets Marine Air-Ground Task Force and DoD vertical heavy-lift requirements beyond 2025. The program is in the System Development and Demonstration (SDD) phase. In FY 2013, DASD(SE) participated in a Program Management Review, Systems Engineering Working Integrated Product Team (SE WIPT) meetings, and a pre-Test Readiness Review (TRR) to assess program maturity.

Mission and System Description: The CH-53K will internally transport passengers, litters, cargo, and vehicles, and includes provisions for weaponry. For external lift of cargo, the CH-53K has three independent cargo hooks and an operational threshold to lift three times the capacity of the CH-53E under high/hot conditions. The aircraft is a dual-piloted, multi-engine helicopter, incorporating the latest vertical lift, survivability, and avionics technologies. It is equipped with a seven-bladed main rotor system, a four-bladed canted tail rotor, and three GE38-1B turboshaft engines.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the CH-53K SEP in December 2011, and the program plans an update in FY 2015 to support MS C. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The program has an Operational Requirements Document that was approved in 2005. A CPD is being developed to support MS C in 2nd quarter FY 2016 and will reflect the program's capabilities roadmap. The program has seven KPPs. All are predicted to be met within the restructured schedule. The CH-53K requirements are reasonable and stable, and the program has taken positive steps to prevent requirements growth. The Capabilities Integrated Product Team (IPT), which meets monthly, serves as a configuration steering board to adjudicate any identified mission-related issues or changes to program requirements.
- **Life Cycle Management** – CH-53K design efforts have included an emphasis on design for maintainability and reliability that should lead to improvements in readiness and reductions in support cost. An 18 percent engine fuel efficiency improvement over the less-capable CH-53E also should yield lower operating costs. The Government is negotiating with the engine manufacturer to procure the engines for the four system demonstration test article (SDTA) aircraft, making them Government-furnished equipment and saving an estimated $9.9 million. The fact that three of the seven KPPs (reliability, logistics footprint, and sortie generation rate) are logistics based is indicative of the program's focus on the platform's life cycle.
- **Program Protection Plan (PPP)** – The MS B PPP was approved by the program manager in 2005 and verified as sufficient in the 2011 approved SEP. The program is updating the PPP to support the MS C decision.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in a prime contractor program review, a TRR dry-run, monthly Capabilities IPT meetings, a Defense Acquisition Executive Summary review,

Data as of 4th quarter FY 2013.

and two SE WIPTs to evaluate technical progress and risk. The SE WIPTs analyzed subsystem qualification failures and associated mitigation plans and program impacts. DASD(SE) maintained frequent contact with the program to facilitate approval of a revised Acquisition Program Baseline (APB). Through this engagement DASD(SE) also obtained program risk and opportunity management processes best practices, which were used to inform the DoD Risk Management Guide update.

- o In FY 2014 DASD(SE) will assess subsystem qualification, Engineering Development Model assembly, subcontractor technical performance, software release and verification activities, and full system testing (engines, rotors, hydraulics, electrical) of the Ground Test Vehicle anchored to a test fixture.

- **Risk Assessments** – The CH-53K program employs a risk, issue, and opportunity management process, as documented in the SEP. The program is working to mitigate risks associated with subsystem qualification testing, manufacturing process maturity, and associated impacts to parts delivery necessary to support first article testing. The program is managing risks and has executable mitigation strategies in place. The program is investigating the root causes for several recent subsystem qualification failures as well as their cost and schedule impacts.

- **Performance** – The program office projects that the seven CH-53K KPPs and 23 of 25 Technical Performance Measures will meet or exceed required performance levels. The program is on track to meet all requirements by FRP.

- **Schedule** – The program is in the SDD phase. MS B occurred in 2005, and MS C is scheduled for FY 2016. USD(AT&L) approved a revised Acquisition Strategy (AS) in 2012 and a revised APB in April 2013 after a series of breaches starting in 2009. The new APB schedule establishes an executable schedule that the program is on track to meet. Qualification test failures, manufacturing challenges, and sequestration funding cuts introduce some schedule uncertainty.

- **Reliability** – The program is executing a reliability growth plan, and system reliability is projected to meet requirements. Current program analysis predicts that reliability will exceed threshold requirements by the FRP decision.

- **Software** – There are 7 million software lines of code, including more than 2 million of new development. The software build for GTV Light Off has been through formal verification, and 10 other software engineering releases have been delivered during the year to the contractor's System Integration Lab (SIL). Software coding and qualification is on track for GTV Light Off in 1st quarter FY 2014 and first flight in 4th quarter FY 2014 with all planned functionality.

- **Manufacturing** – The GTV assembly has been completed, and the remaining four Engineering Development Models are progressing according to schedule despite parts shortages and subsystem qualification failures. The program has a strong focus on producibility, lean manufacturing, modularization, and the use of smart design guidelines for machined parts and tolerances. As a result, air vehicle assembly and wiring activities are generating negligible rework. Component-level qualification verification has revealed several manufacturing deficiencies that the program is addressing, and the casting of gearbox housings continues to prove challenging for the subcontractor.

- **Integration** – The use of mature technologies, with known interfaces, and an aircraft SIL enables the early integration and analysis of key subsystems. There are no known issues affecting current and future interrelationships.

Conclusion: The CH-53K program uses a robust set of metrics along with associated technical processes to assess progress and focus management attention. Qualification issues, which introduced some near-term uncertainty, are being addressed, and the program is well positioned to move into system-level testing on the GTV in FY 2014.

Data as of 4th quarter FY 2013.

Consolidated Afloat Networks and Enterprise Services (CANES)

Prime Contractor: Northrop Grumman Information Systems, Defense Systems Division

Executive Summary: CANES will provide network services for Navy ships and maritime operations centers. The program achieved MS C in December 2012 and is in the Production and Deployment (P&D) phase, currently executing a Limited Deployment (LD) contract during FY 2012–2014. The program is at risk of not achieving the Acquisition Program Baseline (APB) Full Deployment Decision (FDD) threshold date of December 2013; however, the program is executing its revised systems engineering and risk management processes and is on track to demonstrate all KPPs by Initial Operational Test and Evaluation (IOT&E). During FY 2013, DASD(SE) completed a Focused Review and assisted the program in revising its systems engineering planning for the FDD.

Mission and System Description: CANES consolidates existing afloat networks to provide a Common Computing Environment (CCE) that supports network operations in the tactical domain. The CCE architecture scales in configuration to support Navy ships (unit level), battle groups (force level) and maritime operations centers. Force-level systems are integrated with Afloat Core Services software to support a service-oriented architecture (SOA) environment for hosted applications. CANES operates across multiple security enclaves and will increase reliability, security, and interoperability with other applications and services while reducing logistics costs.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The program's last approved SEP supported MS B in August 2010. When a revised SEP was submitted for support of MS C in December 2012, DASD(SE) disapproved the SEP because it lacked plans to integrate and field force-level systems. In response to DASD(SE)'s request, the program submitted a revised SEP to address the deficiencies, and this revised SEP is on track for approval in time to support the first force-level installation beginning in January 2014. The program is executing the processes in the SEP update without waivers or deviations, although it has not been approved.
- **Requirements** – The JROC approved the CDD in October 2008 to support MS B. The Office of the Chief of Naval Operations approved administrative changes to the CDD in October 2012, confirming requirements were reasonable and stable to support MS C in December 2012. The CDD informs the architecture, functional, and item specifications for the system architecture and configuration item structure, which are included in a technical data package provided as part of the production RFP.
- **Life Cycle Management** – The program saved $304 million on the LD contract during FY 2012–2014, allowing the acceleration of Full Deployment from FY 2023 to FY 2020. The program will continue a competitive contracting strategy during the P&D phase to reduce costs, mitigate obsolescence issues, and maintain system readiness objectives. CANES offers potential savings to other programs by hosting their applications on the CANES network in an SOA environment.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in February 2013, for the first ship installation. In approving the PPP, USD(AT&L) requested an update to reassess risk after reviewing supplier threat results and to document plans for continuous review of supply chain risks. The program submitted an update, which is currently in OSD for approval.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed a Focused Review to support MS C in December 2012. A positive finding was the low technical risk for the network architecture to support current and future applications. Other findings included schedule risk to achieve the FDD due to lack of key assessments, the need for metrics to measure progress of system integration efforts, and the lack of a plan to conduct technical refresh for installed systems. The program is implementing DASD(SE) recommendations to address these findings.

- **Risk Assessment** – The program is executing its risk management planning documented in the Risk Management Plan, including convening a monthly Risk Review Board (RRB) to identify, analyze, and mitigate program risks. The program is working to mitigate risks to achieve the FDD, complete application integration in time to support the first force-level installation, and manage deployed systems. The program uses an enterprise risk management tool to standardize risk assessment and reporting consistent with Navy policy.

- **Performance** – The program is on track to demonstrate full compliance with its three KPPs during IOT&E in FY 2014. The IOT&E event will use an LD system in the initial ship installation to demonstrate the system's unit level capability. The program previously demonstrated partial compliance with the KPP critical service elements during system verification events in FY 2012. The program plans to demonstrate the 69 KSAs and 10 Technical Performance Measures for force-level systems by Follow-on Operational Test and Evaluation (FOT&E).

- **Schedule** – The program achieved MS C in December 2012. However, the program is at risk of not achieving the FDD by the Original Estimate of December 2013 and expects to declare a MAIS Critical Change at that time. This schedule delay also constitutes an APB breach. The delay is due to an extended ship availability period that delayed shipboard testing, and additional schedule needed to conduct performance assessments to inform the FDD. The program is working to mitigate this schedule delay but still expects to miss its FDD date by 10 months.

- **Reliability** – CANES exceeded the mean time between failure threshold of 495 hours by 1.8 percent during an initial Operational Assessment in September 2012. The program plans to further demonstrate system reliability as it progresses toward FOT&E in FY 2015, consistent with the growth curve documented in the SEP.

- **Software** – CANES uses software scripts to integrate commercial-off-the-shelf components to construct the system network architecture. The DASD(SE) Focused Review found that the program has no documented plan to develop and manage scripts, nor metrics to measure progress of this effort. Consequently, integration activities may not be completed in time to support fielding. The program is working to document the script effort as part of the SEP update.

- **Manufacturing** – The program is on track to deliver systems to support ship installations authorized at MS C. Eight installations are in progress and on schedule according to the fielding plan. Manufacturing includes the assembly of equipment racks and installing integrated network components into these racks, similar to currently fielded shipboard network systems. Network components include workstations, servers, routers, switches, and data storage.

- **Integration** – The program established memoranda of agreement with all eight external technical organizations required to achieve the force-level capability that supports the SOA environment. Integration verification of these externally hosted applications is scheduled to begin in FY 2014.

Conclusion: The program achieved MS C in December 2012 and is executing its LD contract. The program is at risk of not achieving the FDD by the Original Estimate of December 2013 and expects to declare a MAIS Critical Change at that time. The program is updating its SEP to include force-level plans and is on track to demonstrate all KPPs by IOT&E in FY 2014.

Data as of 4th quarter FY 2013.

E-2D Advanced Hawkeye (AHE)

Prime Contractor: Northrop Grumman

Executive Summary: The E-2D AHE is a manned aircraft supporting battle management command and control in the maritime and littoral theaters of operations. The program is an ACAT 1D program in FRP and is executing to cost and schedule. In FY 2013, DASD(SE) conducted quarterly Defense Acquisition Executive Summary (DAES) assessments.

Mission and System Description: The E-2D AHE is an all-weather, twin-engine, carrier-based, airborne command, control, and surveillance aircraft designed to extend task force defense perimeters. The E-2D provides advanced threat warning of approaching enemy surface units and aircraft, interceptor and strike aircraft attack vectoring, including real-time area surveillance, intercept, search and rescue, communications relay, and air traffic control. Key objectives include improved battlespace target detection and situational awareness, especially in the littorals, and support of theater air missile defense (TAMD) operations, to include naval integrated fire control-counter air for the Carrier Strike Group Commander.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS C SEP in January 2009. The program is fulfilling the objectives of the SEP without waivers or deviations. Future updates are not required for the baseline program.
- **Requirements** – The JROC approved the MS C CPD in September 2008. The program requirements are reasonable and stable. Program requirements are traceable to the performance specifications. The E-2D includes a new solid state, electronically steered ultra-high frequency radar system. The Advanced Hawkeye will incorporate theater missile defense capabilities including an upgraded tactical cockpit, making it possible for the copilot to act as a fourth mission system operator.
- **Life Cycle Management** – The E-2D AHE program was designated an OSD FY 2013 Defense Exportability Features pilot program and drafted lessons learned regarding how design features were incorporated to make the E-2D more exportable. The program intended to reduce costs by procuring aircraft in larger quantities but was unable to because of budget constraints.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in February 2013 to support the FRP decision. The program is executing the processes documented in the approved PPP.

Assessments
- **DASD(SE) Assessments**
  - DASD(SE) conducted quarterly DAES assessments of the system's progress toward meeting KPPs, KSAs, and Technical Performance Measures (TPM) to support the FRP decision in January 2013. The assessments highlighted shortfalls in radar performance and reliability, system availability, and supportability, resulting in degraded mission effectiveness. The program office has developed mitigation plans to resolve known deficiencies.
  - DASD(SE) will continue to perform quarterly DAES assessments in FY 2014. There are no additional systems engineering-related assessments anticipated or scheduled.

Data as of 4th quarter FY 2013.

- **Risk Assessment** – The program is executing its risk management program documented in the SEP. The program is mitigating risks in TAMD, radar performance, mission computer software, track management, and Mode 5/Mode S spectrum usage certification areas.
- **Performance** – The system met 10 of 12 KPPs and 10 of 10 KSAs during the 2012 Initial Operational Test and Evaluation (IOT&E). The radar Operational Availability (Ao) KPP was 15 percent below threshold during the IOT&E, and the Net-Ready KPP was deferred for Systems of Systems components, Cooperative Engagement Capability (CEC), and the Joint Mission Planning System. The testing revealed five major deficiencies affecting air warfare mission accomplishment in the areas of net-ready capability, maintainability, and logistics supportability. The system is not able to sustain the required dual aircraft operations during TAMD due to radar availability. The Net-Ready KPP and TAMD capabilities will be reassessed during the CEC and the E-2D Follow-on Operational Test and Evaluation (FOT&E) periods in 2nd quarter FY 2014. The program office is implementing mitigation plans to resolve deficiencies before Initial Operational Capability (IOC).
- **Schedule** – The program is in FRP and is on track to meet the IOC threshold date of April 2015. It met all Acquisition Program Baseline schedule thresholds except for MS C, which occurred in June 2009 rather than May 2009.
- **Reliability** – The demonstrated radar Ao KPP was evaluated to be 0.70 versus the requirement of 0.85. The program is implementing modifications to primary radar Ao drivers to include the Power Amplifier Module (PAM). The contractor fully implemented PAM and other reliability improvements into the aircraft production line as of aircraft 10 and 13 respectively. These improvements will be retrofitted on the previously delivered aircraft on a demand-driven basis. The program plans to assess radar Ao for new aircraft to verify whether mitigation actions have resulted in improved reliability performance.
- **Software** – The E-2D contains approximately 1.7 million software lines of code. The program released timely software updates to support IOT&E. The program office has developed mitigation plans to correct performance deficiencies found during IOT&E by fall 2014. These corrections are progressing according to plan.
- **Manufacturing** – The contractor consistently produces aircraft on or ahead of schedule and is able to manage subsystem and component deliveries that are late to need. The contractor has established relationships with major suppliers. As of September 2013, there are no major production issues affecting LRIP 3 aircraft delivery dates.
- **Integration** – The CEC system provides connectivity between the E-2D and other air, land, and sea platforms transferring data essential to the TAMD mission. The Net-Ready KPP was assessed during the CEC FOT&E, completed in February 2013. Several discrepancies and limitations restricted a comprehensive assessment. The program plans to reassess the Net-Ready KPP and TAMD capabilities during the 2nd quarter FY 2014 E-2D FOT&E. Interoperability certification testing is conducted under the guidance of the Navy Center for Tactical Systems Interoperability (NCTSI) and Joint Interoperability Test Command (JITC) for Service and joint interoperability, respectively. The program completed NCTSI and JITC data link assessments to support IOT&E, but joint certification relies on the IOT&E as a critical data point and therefore will occur after IOT&E. Joint interoperability certification is required prior to fielding.

Conclusion: E-2D effectiveness and suitability shortfalls were discovered during the 2012 IOT&E. The program office has funded plans to correct known radar-related issues and major deficiencies before the April 2015 IOC threshold.

Data as of 4th quarter FY 2013.

Global Combat Support System–Marine Corps/Logistics Chain Management, Increment 1 (GCSS-MC/LCM Inc 1)

Prime Contractor: Oracle North America

Executive Summary: GCSS-MC provides the initial set of integrated logistics capabilities for Marine Corps field operations. The Navy officially declared a Critical Change in December 2012 after failure to meet the Full Deployment Date (FDD). DASD(SE) supported the assessment of the Management area of the Critical Change Report (CCR).

Mission and System Description: GCSS-MC delivers end-to-end functionality across supply, maintenance, transportation, finance, engineering, health services, acquisition, and manpower systems in accordance with the Marine Corps Logistics Operational Architecture. GCSS-MC provides a single integrated capability to operational forces that supports common logistics processes regardless of location, mission, and theater maturity.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program is not meeting the objectives of the approved November 2009 MS C SEP. During Release 1.2 requirements verification, the program noted significant technical issues and initiated changes to overhaul the engineering organizational structure and function. The program was not following the Systems Engineering Technical Review process as specified in the SEP, had not adequately traced requirements from the CDD to the Requirements Specification, and had underestimated the software development effort. DASD(SE) continues to work with the program to add rigor to the SEP and to draft performance metrics for inclusion in the SEP. There are no waivers or deviations as of FY 2013. The changes have resulted in stabilization of the system and have improved the overall performance.
  Requirements – The Integrated Developmental Test in 3rd quarter 2012 noted deficiencies in requirements traceability to the May 2005 CDD. The program has since initiated an automated tracking system and established an SE Requirements Integrated Product Team to address program requirements and validate traceability to CDD requirements.
- **Life Cycle Management** – To improve cost and performance, the program undertook a full MIL-STD-1629A Root Cause Analysis, uncovering a number of concerns in the Defense Information Systems Agency Defense Enterprise Computing Center installation and support. Changes to the initialization parameters improved the overall efficiency and stability of the GCSS-MC operations. Continued updates will improve long-range sustainment actions and reduce Operations and Support cost by an estimated 10 percent.
- **Program Protection Plan (PPP)** – Program Executive Office-Enterprise Information System approved an abbreviated PPP for Increment 1 in November 2009. In FY 2013, DASD(SE) reviewed the PPP and recommended updating it to satisfy DoD policy for system protection.

Assessments

- **DASD(SE) Assessments** – GCSS-MC reported a Critical Change when it experienced a 12-month slip in the FDD milestone resulting from lack of software maturity and complexity of the deployed capability. DASD(SE) supported the CCR assessment in the Management area with findings in risk management, staffing expertise, software development, and the technical review process. The program accepted and implemented all DASD(SE) recommendations. The Navy approved the CCR recommendation to restructure the program strategy for an Interim Deployed

Data as of 4th quarter FY 2013.

Capability solution (i.e., Release 1.1.1). The past several DAES assessments focused on the core CCR issues: schedule, performance, management, and interoperability.

- **Risk Assessment** – The program did not execute the technical and integration risk plans identified in the SEP, which resulted in a 12-month schedule slip. The levels of effort in system design, program size, and the program's complexity all were risks that contributed to the schedule slip and CCR. The program has developed a revised Risk Management Plan and is actively managing system risk.
- **Performance** – The program met both KPPs and two of the three KSAs for Inc 1. The fielding of the Garrison Version of Release 1.1, completed in October 2012, provided new integrated technology for ground supply, maintenance and service management support (i.e., request and order management); however, the program did not meet the KSA for the full deployed capability due to technical challenges encountered during Release 1.2 verification efforts to assess key functions of the Enterprise Automated Task Organization, data synchronization and Riverbed/ Steelhead Mobile Controller network acceleration tools. The complexity of Release 1.2 design and inadequate verification of software code contributed to the delay and led to an unsatisfactory demonstration of unit level and system integration prior to system verification. The contractor executed 20 software patch attempts to correct system functionality with limited success.
- **Schedule** – Technical issues with Release 1.2 Task Organization and Data Synchronization resulted in a 12-month slip in the Acquisition Program Baseline schedule for the January 2012 FDD, resulting in a declaration of a Critical Change in December 2012. The program initiated corrective actions per the recommendations of the Critical Change Team and is now on track to meet the revised schedule thresholds. Implementation of the Full Deployed Capability solution is being deferred to a future increment.
  Reliability – System reliability is not maturing in accordance with the November 2009 SEP. The GCSS-MC program has a reliability threshold requirement of 716 hours for mean time between mission failure. Various system settings and processes were preventing the system from meeting reliability targets. To date, only 73 percent of the reliability requirement has been achieved. The program took a "tactical pause" in 1st quarter FY 2012 to prioritize the activities affecting system performance.
- **Software** – Software requirements were linked to completion of 206 blueprinted Reports, Interfaces, Conversions, and Extensions (RICE) objects for both Release 1.1 and 1.2. Before requirements verification efforts, Release 1.2 had limited system integration and verification in an operational environment, resulting in a high failure rate during integration testing. The program lacked adequate software metrics. The program is redesigning many of the RICE objects and has established and is tracking software metrics. The program is gaining knowledge of the system as it transitions from commercial to Government system operator/integrator.
- **Manufacturing** – GCSS-MC will continue to deploy all commercial off-the-shelf hardware fielded with Release 1.1; hence manufacturing concerns are minimal.
- **Integration** – The program conducted a full System Verification Review on the as-built GCSS-MC Release 1.1. This review reestablished the product baseline, allocated baseline, and functional baseline for an overarching integrated end-to-end-process-based architecture. This architecture will collapse 4 legacy systems into a single Oracle-based solution. The program established a configuration management process and placed all artifacts and software under Government configuration control. The program office now manages all access and modification to programmatic artifacts and software while optimizing assurances for an integrated system across 46 external trading partners. All required memoranda of agreement are in place.

Conclusion: The Navy delivered the GCSS-MC CCR to Congress in September 2013. The program has restructured the management and governance processes to reduce risk and improve performance.

Data as of 4th quarter FY 2013.

Littoral Combat Ship (LCS) Seaframe

Prime Contractors: Lockheed Martin/Marinette Marine (LCS 1 to 23 odd hulls), General Dynamics/AUSTAL USA (LCS 2, 4), AUSTAL USA (LCS 6 to 24 even hulls).

Executive Summary: The LCS is a high-speed Naval combat vessel employing modular Mission Packages (MP) designed for littoral operations. The LCS Seaframe program is in low-rate production. DASD(SE) participated in an LCS in-depth technical review, which focused on ship construction and MP integration status and risk.

GD-BIW/Austal – Independence Variant

Lockheed Martin/Marinette Marine Freedom Variant

Mission and System Description: The LCS is a fast, agile, and networked surface combatant optimized for operations close to shore. LCS includes two Seaframe designs: the monohull Freedom and trimaran Independence variants. LCS is optimized for flexibility in the littorals and focuses on one of three primary mission areas: mine countermeasures (MCM), surface warfare (SUW), and anti-submarine warfare (ASW). The LCS Seaframes are designed to host modular MPs composed of Mission Modules (MM), aircraft, trained crew, and support equipment. The LCS with installed MPs provides the military capability to execute the primary missions, as assigned. LCS Seaframe core systems also provide for ship self-defense; navigation, command, control, communications, computers, and intelligence (C4I); and other capabilities common to all mission areas.
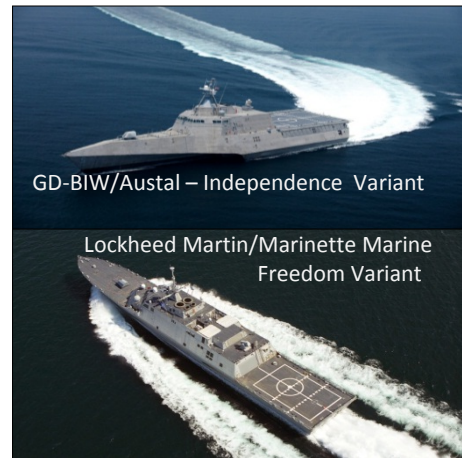
Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the LCS MS B SEP in July 2010. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC validated the LCS Flight 0+ CDD dated June 2008. Seaframe requirements are stable. An Interface Control Document provides detailed requirements to support the MPs.
- **Life Cycle Management** – The combined diesel and gas turbine propulsion plant is designed for high speed with the ability to operate economically at loiter speeds to save operational costs. Automation enables reduced manning; however, the Navy made the decision to increase the core seaframe crew with the addition of 10 sailors to support required taskings and reduce crew fatigue. Modularity provides flexibility, but the cost to swap and recertify MPs onto the seaframe will need to be minimized to manage future life cycle costs.
- **Program Protection Plan (PPP)** – The program has developed a draft PPP version 2.3 dated April 12, 2013, with Navy approval expected in FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in an OIPT, DAB In-Process Review, and in-depth technical review for the combined LCS Seaframe and MM program as directed by the USD(AT&L). The reviews allowed the program managers to provide a status update of the integrated LCS Seaframe and MM program, and to discuss technical risks and issues as the program matures. The Seaframe production schedule has stabilized at both shipyards, and the delivery dates for future ships are predictable with confidence. The MPs provide the military

Data as of 4th quarter FY 2013.

utility on each Seaframe. Post-delivery installation and integration of MPs on each Seaframe has been a challenge but is expected to improve as MPs and Seaframes are delivered.

- o DASD(SE) participates in quarterly Mission Systems Ship Integration Team (MSSIT) meetings, which address interface issues between and within the LCS seaframes and MPs.

- **Risk Assessment** – Technical risks have been identified and are being mitigated in the areas of MP integration, shock qualification, and watercraft launch, handling, and recovery. The program is addressing these risks and executing to the risk management plan summarized in the SEP.

- **Performance** – Six of 10 LCS Seaframe KPPs and all seven KSAs are planned to be demonstrated during Initial Operational Test and Evaluation (IOT&E). The sprint speed and Net-Ready KPPs, plus the materiel availability and systems training KPPs, are planned to be demonstrated in FY 2015 and 2018, respectively. MP integration onto each Seaframe presents unique challenges and performance risks to the combined LCS Seaframe and MM program. PEO LCS established a joint working group with the LCS Seaframe, LCS MM, and RMS program offices to identify and mitigate risks associated with MP integration.

- **Schedule** – LCS 3 and LCS 2, with their MPs, will conduct IOT&E in FY 2014 and FY 2015, respectively. LCS 4 was delivered in September 2013, approximately 6 months behind schedule. LCS 5 and 7 delivery dates are approximately 3 months behind plan. LCS 6 and 8 delivery schedules have been updated to align with shipyard capacity and manpower, are now realistic, and are expected to meet their revised delivery dates. The ship construction schedule at both shipyards appears to have stabilized, and ship delivery dates can be estimated with confidence.

- **Reliability** – The program manager estimates materiel reliability at 92.7 percent, which exceeds the threshold requirement of 85 percent. The program established processes to identify the root cause associated with reliability deficiencies and quickly initiate corrective actions. Reported deficiencies, such as the Ship Service Diesel Generator issues, which required LCS 1 to make unscheduled port visit for repairs, were quickly resolved. A root cause analysis is performed for every deficiency identified prior to initiating corrective action.

- **Software** – Software issues related to the Machinery Plant Control Monitoring System (MPCMS) associated with a high number of software defects have been reported on the odd-numbered hulls. The shipbuilder is resolving the issues within the construction contract.

- **Manufacturing** – Four ships have been delivered, two from each shipyard. The program increased the build rate at each shipyard from one to two ships per year, which challenged the manufacturing capacity of the shipyards. Four ships per year are scheduled to be delivered from FY 2015 through FY 2020. Build sequencing and outfitting inefficiencies at both shipyards were major contributors to projected delivery delays. Automation and capital improvements implemented this past year will help mitigate delays and improve construction efficiency for future builds. New shipyard processes for increased production throughput and renegotiated delivery dates provide a more realistic delivery schedule for LCS 6 and 8. Significant increases in manpower have been reported at each shipyard.

- **Integration** – The major development efforts involve the integration of hardware and software for each MP on each Seaframe. Future increments for each of the MCM and SUW MP add unique mission systems, to include water craft and aircraft to each ship. Handling any new, yet-to-be-developed mission systems will present additional future integration risks.

Conclusion: The LCS Seaframe program is in low-rate production and building four ships per year at two shipyards. A 24-ship buy has been approved and planned through FY 2015. MP installations, which provide the military capability for each Seaframe, present unique engineering and integration challenges. A follow-on procurement decision is needed in FY 2016 to maintain the stability of the industrial base.

Data as of 4th quarter FY 2013.

Littoral Combat Ship Mission Modules (LCS MM)

Prime Contractor: Northrop Grumman Corporation, Integrated Systems

Executive Summary: The LCS MM program will provide the subsystems integrated into Mission Packages (MP) installed onto the LCS Seaframes. The program is in the Technology Development phase. DASD(SE) participated in an LCS MM in-depth technical review, which focused on incremental delivery of capabilities to satisfy the CDD, interface issues with the LCS Seaframe, and technical risk mitigation.

Mission and System Description: The LCS MM program will provide a modular, focused mission capability to counter littoral mine, surface, and submarine threats. Interchangeable MPs installed on the Seaframe provide the means to execute a particular mission such as mine countermeasures (MCM), surface warfare (SUW), or anti-submarine warfare (ASW). An MP consists of MMs, mission crew detachments, and support aircraft. MMs combine mission systems (vehicles sensors, communications, and weapon systems), support equipment, MP computing, and communication hardware and software. The LCS can exchange MPs and supporting crew members in friendly ports to meet changing mission requirements.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program has a Service-approved SEP updated in June 2013 to support MS B. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC validated the LCS Flight 0+ CDD dated June 2008. The CDD is a combined Seaframe and MP requirements document. The MM program has a total of 14 KPPs. The program plans to achieve the KPPs incrementally. Full capability is planned in MCM and SUW Increment 4, and ASW MPs. The Navy issued "Incremental Program Clarification Letters" to define subset requirements for individual mission systems to support incremental demonstrations for MCM Increment 1 and SUW Increments 1and 2 MPs.
- **Life Cycle Management** – The Mission Package Support Facility (MPSF) located in Port Hueneme (CA) has been operational since 2009 and provides configuration management, maintenance, and logistic support for the SUW, MCM, and ASW MMs. The MPSF allows for storage, maintenance, preparation, shipping, and loading of MMs onto the Seaframes. The MPSF will collect maintenance and operational metrics to inform MM planning and upgrades.
- **Program Protection Plan (PPP)** – The Navy approved the PPP in June 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in an OIPT, a DAB In-Process Review, and an in-depth technical review directed by the USD(AT&L). The purpose of the reviews was to allow the program managers to provide a status update of the integrated LCS Seaframe and MM

Data as of 4th quarter FY 2013.

program, and to discuss technical risks and issues with the integrated program. SUW Increments 1 and 2 and MCM Increment 1 system development efforts are nearing completion and are on track to demonstrate compliance to their requirements at Initial Operational Test and Evaluation (IOT&E) in FY 2014 and FY 2015, respectively. The product baseline for all future MP increments, including the ASW MP, is under development and still maturing. MP integration activities for individual mission systems on each Seaframe variant are taking slightly longer than originally planned. A schedule baseline for all future increments was established and documented in the post-MS B Acquisition Program Baseline (APB).

- **Risk Assessment** – The program is executing to the risk management plan summarized in the SEP. The program is working to mitigate MCM MP performance risks in the area of mine detection and classification for the Airborne Laser Mine Detection System (ALMDS) and AN/AQS-20A towed sonar, which could adversely affect MCM Increment 1 MP effectiveness during IOT&E. The program has developed mitigation plans for SUW Increments 1 and 2 MP risks and expects to resolve the risks before IOT&E. Technical risks associated with the development of future MP increments, especially the long-range Surface-to-Surface Missile Module (SSMM), pose integration challenges associated with inserting new capabilities into the SUW MP and on the Seaframes.

- **Performance** – All threshold KPPs for MCM and SUW MPs are planned to be achieved over increments, with full capability planned in FY 2020. The Deep Volume Focused Minehunting sustained area coverage rate KPP presents the greatest challenge for the MCM MP. The AN/AQS-20A towed sonar and ALMDS programs are executing preplanned product improvements to enhance their capabilities in the water column. The SUW Increments 1 and 2 MP is on track to meet its performance requirements, and the program plans to insert the long-range SSMM at Increment 4. A prototype ASW MP completed sea trials from a white ship and appears to have a high likelihood of meeting all four ASW MP KPPs from LCS. The ASW MP development effort will continue through FY 2016.

- **Schedule** – The LCS MM program held a MS B review in July. The MS B decision is pending and expected in FY 2014. IOT&E for SUW Increments 1 and 2 and MCM Increment 1 MPs is planned in FY 2014 and FY 2015, respectively. USD(AT&L) approved an APB that includes a schedule baseline for all future MP increments. SUW Increments 1 and 2 and MCM Increment 1 MPs are on track to meet their Initial Operational Capability milestone dates in the APB.

- **Reliability** –The program developed a comprehensive reliability, availability, and maintainability (RAM) modeling and analysis report for the MCM and SUW MPs. The analysis derives MTBCF (mean time between critical failure) requirements for individual mission systems within an MP. Reliability issues observed with the 30mm guns and the ALMDS are expected to be resolved before IOT&E. The Remote Minehunting System, a mission system within the MCM MP, completed reliability growth testing in FY 2013, exceeding requirements by three times and demonstrating readiness for MCM Increment 1 to begin developmental and operational testing.

- **Software** – The SEP and the Software Measurement Plan provide a minimum set of software metrics to be collected for all software developed under the MM program. An incremental software development approach is under way to add functionality to each new MPAS build version. The largest software development effort involves migrating the MP computing environment (MPCE) to a service-oriented architecture (SOA). The SOA will provide a common software architecture baseline for all MCM, SUW, and ASW MP application software (MPAS). The initial increment will be delivered with ASW MPAS in FY 2015, with additional baselined software development for MPCE 2.0 planned to begin in FY 2016. Incremental software build cycles for all MPs are expected to continue through the end of the program.

Data as of 4th quarter FY 2013.

- **Manufacturing** – Production facilities are diverse and located in multiple sites across the country. Commercial defense contractors develop, upgrade, and produce the individual mission systems that make up an MM. The LCS MM prime contractor procures the basic shipping containers and delivers them to the MPSF for packaging.
- **Integration** – The majority of development involves the integration of individual mission systems into an MM, integration of MMs into an MP, and the integration of an MP into the Seaframe. The primary MP integration points on the LCS Seaframe include the MPCE, MVCS, HM&E (hull, mechanical, and electrical) interfaces in the mission bay area and the LH&R (launch, handling, and recovery) systems. The Mission Systems Ship Integration Team is chartered and meets regularly to resolve MM-to-Seaframe integration issues and risks. MP integration labs at Navy facilities in Panama City (FL), Dahlgren (VA), and Newport (RI) provide accredited and secure integration and test facilities to support individual MM development.

Conclusion: SUW Increments 1 and 2 and MCM Increment 1 MP are on track to demonstrate compliance to their requirements during IOT&E in FY 2014 and FY 2015, respectively. All future MCM, SUW, and ASW MP increments are still in development, maturing, and planned to complete by FY 2020. All MP increments are required to achieve all 14 KPPs in the LCS Flight 0+ CDD.

Data as of 4th quarter FY 2013.

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Mobile User Objective System (MUOS)

Prime Contractor: Lockheed Martin Space Systems

Executive Summary: MUOS is a narrowband Military Satellite Communications (MILSATCOM) system that supports a worldwide, multi-Service population of mobile and fixed-site terminal users in the Ultra-High Frequency (UHF) band, providing increased communications capabilities to smaller terminals while still supporting interoperability to legacy terminals. MUOS is a mature ACAT ID program in the Production and Deployment phase. In FY 2013 DASD(SE) supported an In-Process Review (IPR) and two Quarterly Program Reviews (QPR).

Mission and System Description: MUOS adapts a commercial third-generation Wideband Code Division Multiple Access (WCDMA) cellular technology with geosynchronous satellites to provide a new and more capable UHF military SATCOM system. The constellation of four operational satellites and ground network control will provide greater than 10 times the system capacity of the current UHF Follow-On (UFO) constellation. MUOS includes the satellite constellation, a ground system, and a new waveform for user terminals. The space segment is composed of a constellation of four geosynchronous satellites, plus one on-orbit spare. The ground system includes the ground transport, network management, satellite control, and associated infrastructure to both fly the satellites and manage user communications. The new waveform is a Software Communications Architecture-compliant modulation technique.

The first MUOS-capable terminal which will use the MUOS WCDMA waveform is the Army's Handheld Manpack Small (HMS) Form Fit radio (PRC-155). Other terminals are in development via both formal acquisition programs and non-developmental item endeavors that will provide the MUOS capability to all warfighting segments. Each MUOS satellite also carries a legacy payload similar to that flown on UFO F11. These payloads will continue to support legacy terminals while allowing for a gradual transition to the MUOS WCDMA waveform.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MUOS SEP in August 2013. The SEP focuses on the systems engineering processes and plans for MUOS system verification, full deployment, operations, block upgrades, and sustainment. It also addresses the Navy's role for integrating MUOS end-to-end capability with MUOS-capable terminals. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – MUOS requirements are derived from the 2001 MUOS Operational Requirements Document and a 2003 JROC Memorandum. External interfaces, constraints, and statutory and regulatory direction also provide requirements. The MUOS Performance Specification represents the program office decomposition of these requirements, which the contractor then decomposed into multiple further levels, to the configuration item level. Requirements are reasonable and stable.

Data as of 4th quarter FY 2013.

- **Life Cycle Management** – The program continues to seek opportunities to reduce life cycle costs, through potential streamlined testing in production satellites (SV#3-5) and possible O&S cost reductions related to software management.
- **Program Protection Plan (PPP)** – The program last revised the PPP in 2007.

Assessments
- **DASD(SE) Assessments** – DASD(SE) supported the MUOS IPR in November 2012 and participated in two QPRs.
- **Risk Assessment** – The program is executing the risk management planning reflected in the SEP. All but one of the 122 program risks have been retired. MUOS continues to make progress mitigating the one remaining risk related to site accreditation.
- **Performance** – The program is on track to meet all seven KPPs and System Attributes (SA) by Full Operational Capability. System-level Technical Performance Measures reported at the August 8 QPR are on track. The legacy payload meets performance requirements. The new payload is awaiting further over-the air testing with compatible user terminals, but has passed preliminary on-orbit testing.
- **Schedule** – The last major program milestone was approval for the Follow-On-Buy in 2008, for satellites #4 and #5. Since then, satellites #1 and #2 have launched. Shipment of satellite #3 is at risk as a result of an issue identified in thermal-vacuum testing. Resolution of the issue puts the next Acquisition Program Baseline (APB) Satellite Ship milestone for satellite #3 at risk.
- **Reliability** – The program has no system-level reliability requirement. The program is meeting its key requirement, constellation availability.
- **Software** – The MUOS program has completed software design for both the ground and space segments, pending potential corrective actions arising out of final system testing.
- **Manufacturing** – The MUOS system is a mature program. System design and manufacturing are complete for the first two satellites, which are on orbit, and the ground system. Construction and equipment installation at three of the four ground sites is complete.
- **Integration** – The program is making progress on integration with the HMS terminal; the waveform completed functional qualification in November 2012. Although the HMS program is independent of MUOS, with its own APB, USD(AT&L) directed the MUOS program manager to provide oversight of overall integration. The program conducted successful end-to-end risk-reduction events in March and July 2013, including communications with HMS radios successfully completing the first WCDMA voice and data calls with the on-orbit MUOS-1 satellite and routed through the MUOS ground station in Hawaii.

Conclusion: The MUOS program is technically mature and on track to meet APB thresholds, pending resolution of a satellite #3 technical issue. Integration with the PRC-155 terminal is proceeding.

Data as of 4th quarter FY 2013.

MQ-4C Triton Unmanned Aircraft System (UAS)

Prime Contractor: Northrop Grumman Aerospace Systems

Executive Summary: The Triton will provide airborne persistent maritime intelligence, surveillance, and reconnaissance (ISR) to help maintain the Common Operational and Tactical Picture in the maritime battlespace. The program is in the Engineering and Manufacturing Development (EMD) phase. In FY 2013, DASD(SE) participated in two Flight Readiness Reviews (FRR) and multiple systems engineering working groups and supported an In-Process Review DAB to approve long-lead manufacturing items.

Mission and System Description: The Triton will provide persistent maritime ISR data collection and dissemination as well as airborne communications relay to combatant commanders and other designated U.S. and joint commanders. It will operate independently or with other assets to provide a more effective and supportable persistent maritime surveillance capability than currently exists. Data collected by the Triton will be transmitted to a variety of DoD intelligence activities and nodes. The aircraft provides 360-degree high-resolution, high-quality, digital synthetic aperture radar imagery; electro-optical/infrared imagery; and communications relay capability.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in January 2008 to support MS B and the EMD phase. The SEP is being revised to support the 2015 MS C. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the CDD in May 2007. The requirements are stable. The draft CPD, required for MS C, does not revise the existing seven KPPs. The CDD requirements are traced to the contractor System Specification as verified at the Critical Design Review.
- **Life Cycle Management** – To achieve system affordability goals, the Navy has reduced the number of System Development Test Articles (SDTA) from three to two and deferred a Main Operating Base Mission Control System. The program is incorporating Defense Exportability Features (DEF) into the Triton design to facilitate foreign military sales (FMS) and reduce retrofit cost.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the MS B PPP in March 2006; the program is revising the PPP for MS C. DASD(SE) provided comments and will review the PPP again in 2nd quarter FY 2014. The program is reassessing critical program information, completing a new vulnerability assessment, and applying lessons learned from the Global Hawk program. The DEF Working Group will ensure the PPP addresses FMS considerations.

Assessments
- **DASD(SE) Assessments** – DASD(SE) participated in two FRRs, the Software Design Review, multiple DEF requirements working groups, and a software-focused SE Working Integrated Product Team (WIPT). The FRRs assessed the program's readiness for first flight, which occurred in May 2013. The Software Design Review and SE WIPT assessed the software development risk and schedule and reviewed software development improvement initiatives.
  - The assessments indicated that the flight test program, software development, and safety certification would extend the EMD schedule and delay entry into production. In March

2013, the Navy submitted a Program Deviation Report to USD(AT&L) for Acquisition Program Baseline (APB) cost and schedule breaches. The Program Deviation Report noted a delay to MS C by 16 months and delay to Initial Operational Test and Evaluation (IOT&E) by 12 months.

  o In FY 2014 DASD(SE) will conduct a Program Support Review to assist the program in assessing and mitigating risk for entry into LRIP. Emphasis will include software process improvement, safety certification, and manufacturing readiness.

- **Risk Assessment** – The program is conducting risk management using the Risk Management Process as described in the SEP. The Risk Management Board meets weekly to allocate and prioritize resources to address all risks. Key risks are software safety and development, and the maturation of several radar modes of operation.

- **Performance** – Early analysis indicates the program is on track to meet all seven KPPs and 19 Technical Performance Measure (TPM) threshold requirements at IOT&E. Software safety certification requirements have slowed initial flight envelope expansion and delayed flight verification of performance predictions. The Operational Assessment (OA) before MS C will provide insight into the program's maturity and progress toward meeting the KPPs and TPMs.

- **Schedule** – The primary reasons for the APB breaches were software development delays and related software safety certification issues. The program plans to realign funding necessary to complete software development and the full scope of the test program. Production has been delayed from FY 2014 to FY 2015 because of development delays and cost overruns, sequestration, and additional budget reductions.

- **Reliability** – The reliability requirements, as specified in the CDD and decomposed into TPMs in the SEP, support the persistence KPP. The program projects meeting all threshold values based on analysis. Flight test data will inform the models and will be assessed against the approved reliability growth curve.

- **Software** – Software deficiencies, primarily in the Integrated Mission Management Computer, delayed first flight by 12 months. The program has increased Government and contractor staffing, established weekly Integrated Design Reviews of interim software builds, and implemented software process improvements. Improvements include software defect identification and prioritization, additional schedule allocated to complete corrections of deficiencies, and software safety verification planning. The program's current equivalent source lines of code (ESLOC) totals 2,429,000, with the threshold set at 2,695,000.

- **Manufacturing** – The first EMD aircraft was delivered June 2012 and the second in October 2012. The program is assessing potential manufacturing impacts caused by reprogramming of procurement funding until FY 2015, reduction in Global Hawk procurement, and elimination or restructuring of other FMS and direct sale contracts. The assessment will not be completed until a budget is approved and the program can complete its planning.

- **Integration** – The program has developed Interface Requirements Specifications between the Triton system and 12 segments/programs using an approved DoD Architectural Framework. The program will incorporate a networked communications architecture in alignment with the Global Information Grid through the Distributed Common Ground/Surface System–Navy and Global Command and Control System–Maritime.

Conclusion: The program recognized issues with software development, integration, and certification and has implemented software safety and development process improvements. The flight test program is under way. A revised EMD schedule and cost estimate has been developed, but cannot be finalized until the program budget is approved. Complete system functionality requires additional software and hardware development and maturation.

Data as of 4th quarter FY 2013.

Next Generation Enterprise Network, Increment 1 (NGEN Inc 1)

Prime Contractor: Hewlett-Packard Enterprise Systems (contract awarded June 27, 2013, and was under protest as of the end of FY 2013)

Executive Summary: NGEN Inc 1 is the first increment of the acquisition program that is the follow-on to the Navy/Marine Corps Intranet (NMCI). The program passed MS C. Per direction of the June 27, 2013, Acquisition Decision Memorandum (ADM), the program will be baselined with the MAIS Annual Report.

DASD(SE) conducted a pre-MS C Focused Review in March 2013 to assess the Government's readiness to assume ownership and control of the network.
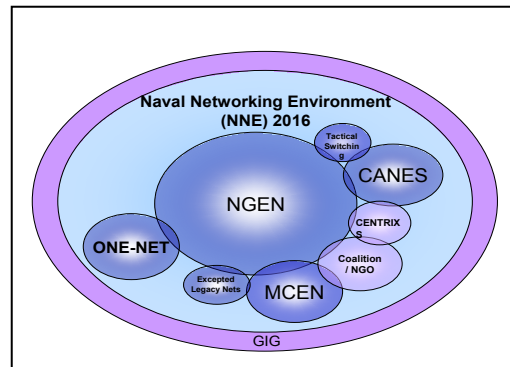
Mission and Description: NGEN Inc 1 includes all services provided by the current NMCI provider as of September 30, 2010, and enables Government ownership of the physical infrastructure, command and control of the environment, and continued support of mandated cybersecurity activities. The transition to NGEN will not require any new development or deliver any new operational capability. NGEN Inc 1 forms the foundation for the Department of the Navy's future Naval Networking Environment, which will be interoperable with other DoD-provided net-centric enterprise services. The network will provide service to 400,000 desktop and laptop computers for 800,000 Navy and Marine end users in more than 2,500 locations.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP on January 25, 2013, to support MS C. No updates are planned. The program is fulfilling the objectives of the SEP without waivers or deviations. The Systems Engineering Technical Review (SETR) events identified in the SEP were delayed due to protest; Preliminary Design Review (PDR) and Critical Design Review (CDR) are now scheduled for February 2014 and March 2014, respectively.
- **Requirements** – The Chief of Naval Operations and the Commandant of the Marine Corps jointly approved the NGEN Inc 1 CPD in August 2012. The Joint Staff waived approval of the CPD because there is no new development. The CPD was developed from the NGEN Inc 1 System Design Specification (SDS), Block 1, Increment 1 v3.1, dated November 9, 2009. The SDS was derived from the earlier NGEN Requirements Document v2.0, dated March 2008, that documented NMCI requirements. The CPD has two KPPs and eight KSAs.
- **Life Cycle Management** – By using the Better Buying Power guidance, the NGEN program structured the Firm Fixed Price Indefinite Delivery/Indefinite Quantity contract to allow adjustment of service level to meet affordability requirements. The Navy minimized the cost of the program by using a lowest price technically acceptable source selection strategy to provide an incentive for lower cost and encourage the contractor to reduce manpower requirements. The Navy purchased Government Purpose Rights from the incumbent and provided data reading rooms to allow offerors equal access to the information necessary to develop proposals.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in May 2013 to support MS C. The program is required to submit an update to support the Final Transition Complete (FTC).

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted two reviews in FY 2013: a DASD(SE)-led initial Focused Review in March and a follow-up review in August. Both reviews were conducted concurrently with the first two NGEN Program Office Government Readiness Reviews (GRR), focusing on the Navy's readiness to assume ownership and control of the network. In the March 2013 review, DASD(SE) identified three major findings and recommended the Navy develop entrance and exit criteria for GRRs 1 and 2; rebaseline the Integrated Master Schedule (IMS) in accordance with the Navy's Execution and Governance Plan for Transition; and reduce risk for a planned upgrade to the order management system during transition. In the August 2013 review, DASD(SE) confirmed the Navy took action on all the earlier recommendations. During FY 2014, DASD(SE) plans to conduct a second follow-on Focused Review and participate in SETR events.
- **Risk Assessment** – DASD(SE) identified three program risk areas during the FY 2013 Focused Review: The Navy had not developed metrics to measure its readiness to transition; the program's IMS was lacking the level of detail necessary to manage transition activities; and the upgrade to the order management system. The Navy took adequate actions to handle the identified risks. Entrance and exit criteria were developed for GRRs 1 and 2, and the IMS will be rebaselined after the protest resolution.
- **Performance** – Performance of the NGEN will be achieved throughout transition. The NGEN KPPs and KSAs will take effect at the end of the transition from NMCI to NGEN. Until then, the NMCI contractor will continue to provide services, with network performance measured in accordance with the CPD KPPs, per direction in the August 9, 2013 ADM, as well as the KPPs under the Continuity at Services Contract (CoSC).
- **Schedule** – The network is scheduled to fully transition from NMCI to NGEN in 1st quarter FY 2015, due to the effect of the protest delay. The program has adequate planning in place, including a possible extension of the current support contract activities and investigation to accelerate transition. The NGEN schedule will be baselined in the MAIS Annual Report of December 31, 2013, which will be provided to Congress on March 24, 2014.
- **Reliability** – Until completion of the full transition from NMCI to NGEN, the program will use the KPPs identified in the CPD, with emphasis on KPP 2, Sustainability (Availability). Sustainment of the existing network will be measured by the operational availability of user authentication and network connectivity. KPP 1 refers to the net-ready requirements.
- **Software** – NGEN will use software operating on a commercial-off-the shelf (COTS) information technology infrastructure. Commercial tracking and management tools are used for Navy command and control, which will be low risk. No new software development is planned through FTC. The program has elected to defer upgrades to the order management tool until after FTC.
- **Manufacturing** – The NGEN program has no manufacturing. The program uses COTS equipment procured through DoD or Department of the Navy Basic Ordering Agreements.
- **Integration** – Government transition and PDR/CDR SETR events are key activities that have been delayed by the contract protest that poses a risk to the FTC schedule. The program has adequate planning in place pending protest resolution.

Conclusion: NMCI to NGEN transition activities are delayed by the contract protest and therefore require modification to the schedule in the August 9, 2013, ADM. The NGEN schedule will be baselined in the MAIS Annual Report of December 31, 2013, which will be provided to Congress on March 24, 2014.

Data as of 4th quarter FY 2013.

Next Generation Jammer (NGJ)
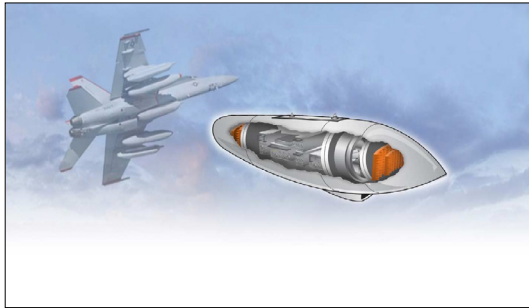
Prime Contractor: To be determined (source selection)

Executive Summary: The NGJ is a Navy program to develop a new Stand-off/Mod-escort Tactical Jamming System (TJS) to replace the aging ALQ-99 TJS on the EA-18G. NGJ will be the EA-18G's primary offensive airborne electronic attack (AEA) system. DASD(SE) supported the Detailed Design Reviews (DDR) of the four competitors in the Technology Maturation (TM) phase in January and February. NGJ completed MS A in July 2013 authorizing the program to enter Technology Development (TD). The Navy conducted a full and open competition in which three proposals were received. The subsequent award to one offeror for pod development was protested to the Government Accountability Office (GAO). In November, GAO sustained portions of the protest and recommended that the Navy reevaluate proposals and properly document the evaluation record. The NGJ program is complying with the recommendation.

Mission and System Description: The NGJ AEA capability supports the joint force commander's requirement to gain and sustain access to the battlespace. AEA capabilities tie directly to the Capstone Concept for Joint Operations, Joint Operating Concepts, and Joint Functional Concepts. NGJ will assist major combat operations by gaining operational access, denying the enemy battlespace awareness, denying the enemy freedom of action, and disrupting the enemy's ability to command and control his forces. NGJ will be used mainly to support Suppression of Enemy Air Defenses (SEAD). NGJ also will be used in conventional and irregular warfare when operating in non-defended airspace. NGJ will provide improved AEA capabilities against a variety of radio frequency (RF) targets including radars, communications, data links, and other RF-based systems. The system will improve interoperability and increase capacity to degrade, deny, and deceive adversary RF systems. NGJ will have increased Effective Isotropic Radiated Power over legacy systems to enable robust jamming at greater standoff ranges. Increment 1 Initial Operational Capability is planned for 2020.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the NGJ SEP in May 2013 to support the MS A in July 2013. The program is fulfilling the objectives of the SEP without waivers or deviations. The Navy will update the SEP with Technical Performance Measures (TPM) when the program has a confirmed contractor.
- **Requirements** – The JROC approved the AEA Initial Capabilities Document in November 2004. The program conducted a System Requirements Review (SRR) in February 2012 to approve the System Performance Specification. Program maturation and design refinements are expected to result in a second SRR with the prime contractor in FY 2014. There are four KPPs and seven KSAs. The program requirements are reasonable and stable. The program conducted competitive prototyping as part of the TM phase to reduce the risk associated with a single source selection at MS A. The program also leveraged the Office of Naval Research Future Naval Capability (FNC) project for next generation airborne electronic attack component technologies.

- **Life Cycle Management** – The program has three Sustainment KSAs: materiel reliability, ownership cost, and system training. The design of the five major subsystems (power generation, antenna arrays, beam formers, exciters, and power amplifiers) is modular and will enable reduced life cycle costs and improve sustainability.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in April 2013 to support the MS A in July 2013. The program is executing the processes documented in the approved PPP.

Assessments
- **DASD(SE) Assessments** – DASD(SE) participated in a review of the TM phase directed by USD(AT&L). Reviewers assessed the maturity of the contractors' designs and prototypes, which contributed to the MS A decision to down-select to a single contractor for TD. DASD(SE) led integration reviews with the program, EA-18G (lead platform), and the Jammer Technique Optimization group to ensure contractors participating in TM were adequately addressing issues and requirements. A post source selection Focused Review of NGJ is planned for FY 2014.
- **Risk Assessment –** During the TM phase, each contractor developed and maintained separate risk management processes. The program also implemented a formal Risk and Opportunity Management process based on the NAVAIR Risk Management Policy. Using the standard NAVAIR risk process, the program is identifying and actively managing risks, and mitigation actions are on track. NGJ is executing a risk management program as documented in the approved SEP. The program will assess the specific risk of the selected contractor's design once the source selection is complete and TD phase execution begins.
- **Performance** – Entering TD, the program is on track to meet the KPPs and KSAs as well as the draft TPMs documented in the SEP by the FRP decision.
- **Schedule** – The program conducted DDRs with each of the four contractors from January to February 2013. DASD(SE) participated in all of these reviews. A MS A DAB took place in July 2013, authorizing the program to initiate the TD phase. The program has been delayed by a protest filing and subsequent GAO sustainment of portions of the protest. A 22-month TD phase will commence once contract execution commences. PDR is expected to be delayed by 7 months.
- **Reliability** – DASD(SE) worked with the NGJ program to establish a reliability growth and improvement program. Based on the DDRs with the four contractors, the program anticipates meeting the system-level draft CDD requirement of 23 mean flight hours between operational mission failures.
- **Software** – Software development is not expected to be a challenge based on experience with the development of similar capabilities.
- **Manufacturing** – Manufacturing risks are not expected based on experience and existing production of similar components and technologies.
- **Integration** – Four contractors competed for a single award at MS A. All had varying subsystem performance allocations based on past performance of legacy programs. Although the individual contractors reported success for the respective allocations, the rollup of risks for space, weight, power, and cooling is assessed as medium. At the conclusion of the GAO-directed reevaluation period, DASD(SE) will conduct a Focused Review with the program office to develop specific TPMs and assess the integration status of the design for the selected contractor.

Conclusion: The program completed MS A in July 2013. The program will begin TD phase activities once implementation of GAO recommendations and source selection are complete.

Data as of 4th quarter FY 2013.

OHIO Class Submarine Replacement
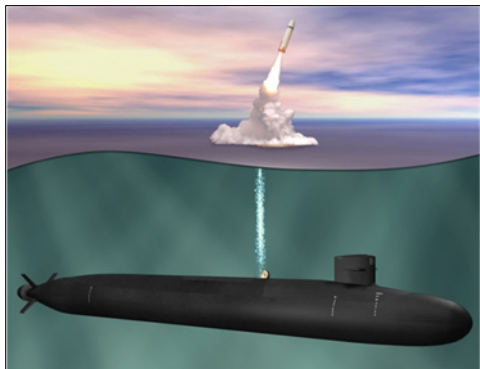
Prime Contractor: General Dynamics, Electric Boat Division

Executive Summary: The OHIO Replacement program is a pre-MDAP to design, build, and sustain a replacement for the OHIO Class Fleet Ballistic Missile Submarines (SSBN), which will retire at the rate of one per year beginning in 2027. DASD(SE) participated in a USD(AT&L) deep dive review that focused on technology development, engineering, integration, risk, and affordability.

Mission and System Description: The OHIO Replacement program will design and construct a replacement for the OHIO Class Fleet SSBNs, which begin retiring in 2027 at a rate of one per year. The program goals are to provide an affordable platform capable of executing the strategic mission while remaining survivable through 2080. The mission of the OHIO Replacement is strategic deterrence, which will be enabled through the integration and deployment of the TRIDENT II D5 LE Strategic Weapon System (SWS) on a new submarine class that satisfies the Sea Based Strategic Deterrent (SBSD) Initial Capabilities Document and Chief of Naval Operations–approved CDD attributes.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in September 2010, to support MS A. An update is expected in FY 2015 to support the Development RFP Release Decision Point. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The program has a JROC-approved Initial Capabilities Document. The Chief of Naval Operations approved the Service CDD in August 2012. The program office is translating the requirements into the ship specifications, informed by cost trades, system concepts, and early stage component development. The OHIO Replacement HM&E (hull, mechanical, and electrical) baseline characteristics outline, with identified trade space, is complete. The program has challenging requirements associated with survivability, increased stealth, increased life, and affordability.
- **Life Cycle Management** – The program is using a design, build, and sustain systems engineering process while monitoring Operations and Support (O&S) should-cost estimates. Activities include design for affordability and reduction of total ownership cost initiatives. Major design initiatives include the potential elimination of a mid-life refueling overhaul and the development of more reliable subsystems to increase operational availability between planned depot maintenance periods.
- **Program Protection Plan (PPP)** – The program has not yet started developing a PPP, but plans to submit one to support the Development RFP Release Decision Point review.

Assessment

- **DASD(SE) Assessments** – DASD(SE) supported a USD(AT&L) deep dive in January 2013, which focused on technology development, engineering, integration, risk, and affordability.

Data as of 4th quarter FY 2013.

Design for affordability, design for supportability, and should-cost initiatives are on track and embedded in all research and development activities.

- **Risk Assessment** – The program established a Risk Management Plan dated March 2009 and is executing risk mitigation efforts associated with the new coordinated stern, propulsor, Common Missile Compartment (CMC), SWS, and electric drive designs. These systems represent the most significant engineering and integration risks toward achieving operational requirements and affordability goals. The program office is actively mitigating technical risks.

- **Performance** – The Survivability, Sustainment, and Training KPPs represent the most challenging requirements that drive unique HM&E ship design characteristics, technology development efforts, and infrastructure requirements. The program office is developing and maturing the ship design to ensure all CDD requirements will be achieved.

- **Schedule** – The program is in the Technology Development (TD) phase and achieved MS A in January 2011. The Development RFP Release Point and MS B Decision review are planned for FY 2016. Lead ship construction start is planned for FY 2021.

- **Reliability** – A preliminary Reliability, Availability, Maintainability and Cost (RAM-C) Rationale Report is under development and will provide the failure definition and scoring criteria to support materiel reliability requirements. Reliability block diagrams and failure mode effects analyses will be developed to support preliminary design.

- **Software** – The re-hosting of SWS software represents the largest software-development effort in the program. Participating Acquisition Resource Managers (PARM) will be responsible for all Non-Propulsion Electronic Systems software. A program-wide Software Development Plan with metrics is needed to estimate the total program effort associated with software development.

- **Manufacturing** – The program is applying competitive prototyping to re-start the dormant industrial base to design and build the quad pack CMC. The missile tube quad pack and modular construction process will reduce the construction schedule and cost compared with the legacy OHIO Class submarine ship building processes. Targeting cost reduction as the primary benefit, the program is applying design for manufacturing initiatives to reduce touch labor hours associated with ship construction.

- **Integration** – Major Area Integration Teams (MAIT) are responsible for overarching technical oversight and integration. MAITs interface with Major Area Teams (MAT) to resolve issues with spatial arrangements and integration of major modules and integration of major ship subsystem modules. System integration is conducted across structural modules and between systems and subsystems. Program Executive Officer (Submarines) established responsibilities and agreements between the OHIO Replacement program and PARMs to ensure integration and operation of all non-propulsion systems. Two SWS shore test facilities are under construction to mitigate missile launch risk and SWS-OHIO Replacement integration risk. Both are required to ensure the program achieves the SWS Support KPP.

Conclusion: TD phase engineering and integration design activities focus on survivability, sustainment, SWS support, reduction of technical risk, and program affordability initiatives. The program is on track to provide a mature design at construction start in FY 2021.

Data as of 4th quarter FY 2013.

P-8A Poseidon

Prime Contractor: The Boeing Company

Executive Summary: The P-8A Poseidon is an ACAT ID program being fielded to replace the Navy's P-3C Orion. It will serve as an anti-submarine warfare (ASW) and anti-surface warfare (ASuW) platform providing intelligence, surveillance, and reconnaissance (ISR) as a member of the Maritime Patrol and Reconnaissance Force (MPRF) family of systems. Currently in low-rate production, the program is scheduled for a 1st quarter FY 2014 FRP decision. In 2013, DASD(SE) assessed production readiness and corrections to deficiencies from the Initial Operational Test and Evaluation (IOT&E) and performed an assessment on the Increment (Inc) 3 program.

Mission and System Description: The P-8A is a military variant of the Boeing 737-800ERX configuration, with the addition of unique P-8A structures and systems. The primary roles of the P-8A are persistent ASW and ASuW and to serve as an armed ISR aircraft capable of broad-area, maritime, and littoral operations. The P-8A program is structured on an evolutionary systems replacement approach that aligns requirements with incremental acquisition and development strategies. Inc 2 capabilities are being implemented as Engineering Change Proposals to the baseline aircraft, and Inc 3 will deliver enhanced net-centric capabilities such as a net-enabled weapon via a new open architecture. The P-8A is a member of the MPRF family of systems, which includes the MQ-4C Triton, the EP-3, and the Tactical Operations Center.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2010. The program is fulfilling the objectives of the SEP without waivers or deviations. Sixteen of 18 certifications are complete, with the remaining two expected by Initial Operational Capability (IOC). The program is finalizing a capstone SEP update in preparation for a 1st quarter FY 2014 FRP decision and the Inc 3 Technology Development (TD) phase that details the technical approach for all three increments.
- **Requirements** – The JROC validated the P-8A CPD for Inc 1 (the baseline aircraft) in June 2009. Capabilities for follow-on Incs 2 and 3 were validated in a June 2010 CDD. The P-8A program has seven stable KPPs, which were demonstrated in the 2013 IOT&E.
- **Life Cycle Management** – The program identified selected parts to procure directly from suppliers to provide as Government-furnished equipment (GFE) and is expanding its GFE strategy with subsequent production lots. These parts include various radios, the APY-10 radar, and other airframe equipment. The program is combining Directional Infrared Counter Measures turret purchases with the Air Force and converting P-8A training situational analysis from contractor-furnished information to Government-furnished information to reduce costs.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in August 2010 in support of the MS C decision. The program is implementing measures to protect critical information and mitigate supply chain risks. The program is preparing an updated PPP for a 1st quarter FY 2014 FRP decision along with a new Inc 3 PPP in preparation for the TD phase.

Data as of 4th quarter FY 2013.

Assessments
- **DASD(SE) Assessments** – DASD(SE) FY 2013 assessments confirm the P-8A program is ready for FRP. LRIP aircraft deliveries have been on time, and the program has corrected IOT&E and other deficiencies to mitigate risks for operational deployment.
    - DASD(SE) participated in program office-led delta Production Readiness Reviews (PRR) with critical suppliers. All suppliers are assessed as ready to support FRP with acceptable risks.
    - DASD(SE) conducted a Program Support Review to assess the program's technical and material readiness for the Inc 3 Technology Development. Inc 3 intends to implement an applications-based architecture to promote interoperability and ease of future technology integration. The review recognized the program has well-developed processes and procedures in place to manage external dependencies. The review recommended changes to the draft statement of work to align with the program planning documents. DASD(SE) provided recommendations in the areas of software planning, schedule phasing, and requirements management areas.
    - No formal DASD(SE) assessments are planned for FY 2014.
- **Risk Assessment** – The program continues to implement risk management processes in accordance with the SEP and October 2009 Risk, Issue, and Opportunity plan. The program is working to mitigate diminished manufacturing source risks and other supplier risks.
- **Performance** – The P-8A program is currently expected to meet all seven KPPs by the FRP decision. The program has made significant progress in correcting deficiencies in the radar, communications, and Electronic Support Measures systems. Corrective actions are undergoing verification in the Follow-on Operational Test and Evaluation and are expected to meet requirements.
- **Schedule** – The program is expected to meet its October FRP Acquisition Program Baseline schedule threshold date and all future program baseline dates. The FRP decision was originally scheduled for July 2013 but was postponed to October for the program to complete evaluation of corrective actions on ASW and ISR issues.
- **Reliability** – The program is exceeding its logistics reliability (mean flight hours between failure) KSA by 300 percent. Software fixes and increased stability contributed to improved mean time between operational mission failures rates. Recent corrections to several communications, radar, and other systems should result in continued reliability improvements.
- **Software** – The program eliminated all priority 1 Software Trouble Reports (STR) prior to the IOT&E and has made significant progress closing most priority 2 STRs. None of the remaining STRs will interfere with deployment of operational squadrons. The resolution of software defects and increased stability are expected to contribute to increased reliability and availability.
- **Manufacturing** – The program monitors production readiness with the contractor and suppliers on a regular basis. The program completed delta PRRs with critical suppliers based on predefined criteria and performance. Non-conformance reports found during aircraft acceptance inspections are down by more than 10 percent from LRIP I to LRIP II aircraft. LRIP II aircraft have averaged about 26 percent less scrap, rework, and repair costs than LRIP I aircraft.
- **Integration** – The program has successfully integrated and evaluated the Mk-54 torpedo and AGM-84 Harpoon missile during ground and flight testing. Memoranda of agreement are in place with both program offices to manage the ASW and TACMOBILE integration efforts.

Conclusion: The program has demonstrated effective systems engineering planning, rigor, and cooperation among the program manager, the requirements community, and the contractor. The program met the FRP threshold established at program initiation and is on track to meet FRP and IOC target dates.

Data as of 4th quarter FY 2013.

Presidential Helicopter Fleet Replacement (VXX)

Prime Contractor: To be determined (in source selection)

Executive Summary: VXX is a non-standard Navy program to replace the legacy fleet of executive lift helicopters. The acquisition approach to satisfy the Presidential vertical lift requirement is a competitive procurement of a proven, existing helicopter as the air vehicle replacement and the integration of a Government-defined mission system by the prime contractor. Based on this strategy, the program does not require a Technology Development phase and will enter at MS B. DASD(SE) participated in the Government System Requirements Review, the Mission Communications System (MCS) Preliminary Design Review (PDR), and the program RFP peer review.

Mission and System Description: The VXX mission is to transport the President and Vice President, visiting heads of state, and other parties as directed by the Director, White House Military Office. Missions are accomplished today with a combination of VH-3D and VH-60N aircraft. VXX intends to procure a single type/model/series aircraft.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the VXX SEP in February 2013. The program is fulfilling the objectives of the SEP without waivers or deviations. The SEP contains a robust set of Technical Performance Measures (TPM) that the program will use to track technical performance to plan throughout system development and integration.
- **Requirements** – The JROC approved the CDD in January 2013. The Navy used the cancelled VH-71 program CDD as a baseline and incorporated information from an extensive Analysis of Alternatives and requirements trade studies to draft the current CDD. Stakeholder organizations approved changes to the original requirements to facilitate the procurement of a cost-effective solution. A senior-level advisory board will meet regularly to help mitigate mission and system requirements changes during the development process. The program provided a Performance-Based Specification, traced to the CDD, as an attachment to the RFP.
- **Life Cycle Management** – The SEP describes reliability and maintainability engineering activities, and the program intends to use mature technologies in a proven, existing aircraft. The program is pursuing a "best value" approach and has presented affordability targets that demonstrate significantly lower procurement and life cycle costs compared with the VH-71.
- **Program Protection Plan (PPP)** – The VXX PPP was submitted in 4th quarter FY 2013 for approval.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in the MCS PDR, OSD peer review of the program RFP, multiple Systems Engineering Working Integrated Product Teams (SE WIPT), and OSD reviews to support RFP release approval at the In-Process Review DAB. The program improved the fidelity of its acquisition documentation and engineering planning activities in 2013. The MCS PDR revealed an issue with the allocation of space, weight, power, and cooling

Data as of 4th quarter FY 2013.

(SWaP-C) between the MCS and the air vehicle. The program completed SWaP-C reallocations, particularly weight, to address the issue.

o   In FY 2014 the program will conduct the MCS Critical Design Review (CDR) and will engage in regular SE WIPTs in preparation for the MS B DAB.

- **Risk Assessment** – The program is executing the risk management planning documented in the approved SEP. Initial risks have been assessed in the areas of integration, air worthiness certification, commercial-off-the-shelf supportability, and weight management. The program will perform a risk assessment as part of source selection and will update the risk assessment after contract award.

- **Performance** – The TPMs in the SEP are specific enough to provide meaningful tracking through system development and will be tailored to the specific airframe selected. The program is in source selection; therefore, actual system performance cannot yet be evaluated. The procurement of a mature, in-production aircraft significantly reduces aircraft performance risk.

- **Schedule** – The program is pre-MS B. The JROC approved the CDD in January 2013. The program released the RFP to industry in May 2013 for integration and production. MS B, planned for 2nd quarter FY 2014, will be the first formal acquisition milestone. The program schedule is reasonable, complete, executable, and includes the necessary technical reviews for proper program execution. The program will conduct a system PDR after contract award and will include the MCS integration. The program will establish a schedule baseline at MS B, and an Integrated Master Schedule will be developed after contract award.

- **Reliability** – The program used the mission scenarios in the Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report to determine the system reliability requirements and the fleet size requirements. System reliability will be heavily dependent on the platform selected but must meet the VXX requirement in order to maintain the desired fleet size. Market research and existing data support the program's assessment that reliability requirements are achievable.

- **Software –** The SEP defines software architecture priorities, addresses interface control requirements, and identifies appropriate metrics such as requirements stability, lines of code, memory usage, and processor throughput that the program will use to manage software development. The 2nd quarter FY 2014 CDR for the Government design of the MCS will provide additional insight into software configuration plans for this software-intensive element of VXX.

- **Manufacturing** – All expected offerors have existing production lines with sufficient capacity to support the planned production levels.

- **Integration** – The VXX program office understands the interrelationships, dependencies, and synchronization with complementary systems within the existing presidential transportation environment. The associated integration effort will depend on the platform selected and on the Government plans for developing the mission systems.

Conclusion: The VXX program has effectively used the trade study process to establish a reasonable set of achievable requirements and reduced technical risk. This approach, along with the program's informed systems engineering, program planning, and source selection efforts, should result in an executable acquisition program.

Data as of 4th quarter FY 2013.

Remote Minehunting System (RMS)

Prime Contractor: Lockheed Martin, Undersea Systems

Executive Summary: The RMS consists of a semi-submersible Remote Multi-Mission Vehicle (RMMV) towing an AN/AQS-20A Variable Depth Sonar (VDS) to detect, classify, localize, and identify mines in shallow and deep water. The program is in the Engineering and Manufacturing Development phase, focusing on RMMV reliability improvements. DASD(SE) conducted an assessment of the Reliability Growth Program (RGP) and participated in two RMS System Design Reviews.

Mission and System Description: The RMS will be deployed and maintained from the Littoral Combat Ships (LCS) as part of the ships' Mine Countermeasures (MCM) Mission Package. It enables LCS to detect, identify, and localize mines while keeping LCS and the sailor at a safe standoff distance from the mine field. It is designed for the detection, classification, identification, and localization of bottom and moored targets in shallow and deep water. The RMMV is assured a high probability of survival in the minefield due to its minimal influence signature. The RMMV provides a stable platform to tow the VDS to the operation area where mine reconnaissance data will be collected, recorded, and transmitted to the host ship. The RMMV provides propulsion, electrical and hydraulic power, communications, and navigation for itself and the VDS. Command and control information and sensor contact data links are maintained between LCS and the RMMV.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in June 2011. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is preparing a SEP update to support MS C planned in FY 2014.
- **Requirements** – The program has an approved CDD dated May 2011. A draft CPD was approved by the Chief of Naval Operations in December 2013 and is currently in joint review. Program requirements are reasonable and stable, and form the basis of the Technical Data Package intended for the procurement of future vehicles. The RMMV completed its RGP and exceeded its mean time between operational mission failure (MTBOMF) requirements as demonstrated by the contractor.
- **Life Cycle Management** – The SEP describes the Sustainment KPPs and their integration into the design process. The program seeks to reduce life cycle costs by improving reliability, maintainability, mitigate obsolescence, and build/sustain process controls.
- **Program Protection Plan (PPP)** – The program is preparing a PPP to support MS C.

Assessments
- **DASD(SE) Assessments** – DASD(SE) participated in two System Design Reviews (SDR) to assess compliance with functional requirements; space, weight, power, and cooling budgets; and physical integration into LCS 2 hull design. The SDRs addressed technical design changes to

improve reliability, maintainability, and fleet operations. The RMS PMO ensures a coordinated effort exists with the LCS Seaframe and LCS Mission Module PMO.

- o DASD(SE) monitored the reliability growth program through RMMV v4.2, which exceeded its minimum MTBOMF requirements demonstrated during contractor offshore testing. The program will implement design modifications and improvements to the existing 10 vehicles to bring all configurations up to RMMV v6.0.
- o A program support assessment planned in FY 2014 will be performed to identify risks and inform the USD(AT&L) of the program's readiness for MS C.

- **Risk Assessment** – The program is executing its risk management plan in accordance with the SEP. Current program risks include: RMS operational availability, long scope re-acquire and/or localization, tow cable corrosion, and integration with LCS Seaframe and Mission Modules. The PMO is adequately addressing and mitigating risks.

- **Performance** – The RMMV v6.0 technical improvements along with the AN/AQS-20A preplanned product improvements (P3I) put RMS on track to achieve all seven KPPs and three KSAs by Initial Operational Test and Evaluation (IOT&E) in FY 2017. The AN/AQS-20A P3I will replace the forward look and side look sonar arrays to improve deep-volume mine detection and image classification to achieve the sustained area coverage rate KPP.

- **Schedule** – The PMO completed the reliability growth program with RMMV v4.2. Design modifications and improvements to the technical data package to v6.0 were completed, with implementation planned in FY 2014 to v6.0. The RFP for 10 LRIP 2 vehicles is planned for release in FY 2014. RMS is on track to meet MS C planned for FY 2014. IOT&E planned in FY 2015 will use the RMS configured with the RMMV v6.0 and the AN/AQS-20A P3I towed sensor product baseline design.

- **Reliability** – The program is on track to meet its reliability requirements. RMMV v4.2 demonstrated a MTBOMF improvement from 45 hours to 213 hours during contractor offshore testing. While significant challenges still exist with the current RMMV and AN/AQS-20A designs, the measured reliability is sufficiently high enough for the program to enter developmental and operational testing on the LCS. Reduced measures of reliability are anticipated during operations from LCS, but still expected to exceed the 75-hour threshold requirement.

- **Software** – The RMMV software executes vehicle control, towed sonar data processing, alert generation, VDS control, mission track execution, and data communication to LCS. These functions were verified by the PMO and contractor. The LCS Mission Package Application Software provides shipboard control, processing, and display and is integrated as a functional segment of the LCS MCM Mission Package Computing Environment.

- **Manufacturing** – Improvements in process and quality control during the past year at the contractor's facility helped the program identify the root cause of deficiencies identified during test and to insert corrective actions and design changes in the baseline design. Lessons learned were incorporated into performance-based specifications and a technical data package for the competitive procurement of LRIP 2 vehicles. The 10 existing LRIP 1 vehicles will be upgraded to the v6.0 baseline design.

- **Integration** – Shipboard integration risks between the RMS, LCS Mission Modules, and both LCS variants regarding the Launch, Handling, and Recovery System and communications have been reduced, but if not retired, could impact LCS deployment of the MCM Mission Package.

Conclusion: The RMS program improved vehicle performance and reliability and is on track to complete MS C and proceed to low-rate production.

Data as of 4th quarter FY 2013.

Ship to Shore Connector (SSC)
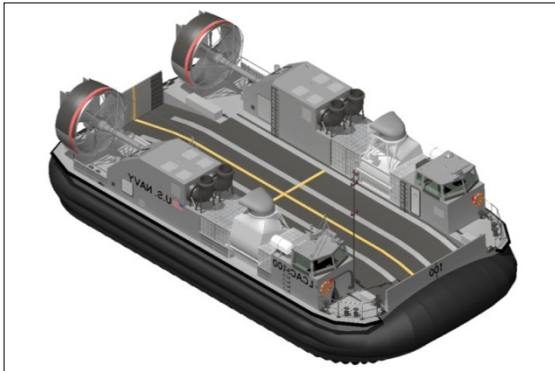
Prime Contractor: Textron, Inc.

Executive Summary: The SSC is a modified replacement for the aging Landing Craft, Air Cushion (LCAC) and will operate from amphibious assault ships to transport joint forces engaged in operational maneuvers from the sea (OMFTS). SSC provides the capability to transport heavy equipment and combat-ready personnel over land, water, beach/surf zones, mud, and ice. The program is in the Engineering and Manufacturing Development phase. DASD(SE) participated in quarterly program reviews, technical focus sessions, and subsystem design reviews to assess design maturity and risk.

Mission and System Description: The SSC will provide the transport of joint forces engaged in OMFTS. SSC provides the ability for the transfer of combat-ready personnel, tracked and wheeled vehicles, heavy equipment, and supplies to austere littoral access points ashore in various scenarios and environmental conditions. The SSC will support conventional combat operations and other domestic and international non-combatant and non-military operations, such as humanitarian aid. The SSC is the functional replacement with commonality to the existing LCAC with noted advances in performance, cargo capacity, lift, automation, reliability, and maintainability. The craft is composed of an aluminum hull structure, a flexible skirt that surrounds the bottom of the craft, and four gas turbine engines driving two centrifugal lift fans, two propulsors, and two bow thrusters. Service generators and auxiliary power units provide craft electrical power. A Command, Control, Communications, Computers and Navigation (C4N) suite subsystem supports craft operations.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SSC SEP in June 2012. The program is fulfilling the objectives of the SEP without waivers or deviations. The Textron Systems Engineering Management Plan aligns with the program SEP to guide the contractor's developmental efforts, synchronized with PMO activities, and consistent with Navy systems engineering technical review criteria.
- **Requirements** – The JROC approved the CDD June 2010. The CDD requirements are reasonable and stable. The SSC program has eight KPPs, including Materiel Availability, payload capacity, interoperability with amphibious and well deck ships, and inland accessibility. The prime contractor is using a requirements management tool to track all requirements to the contract baseline.
- **Life Cycle Management** – The PMO is addressing total ownership cost reductions through craft weight management and maintenance design considerations. Current craft weight allocations challenge the contractor to maintain payload and design margins. Reliability centered maintenance is influencing both the periodicity of maintenance and ease of access for subsystems and components maintenance actions.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in January 2012. The program is planning an update to support the MS C review in 2015.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in quarterly program reviews, technical focus sessions, and design reviews to assess design maturity and technical risk. SSC development is tracking with the program SEP and Acquisition Program Baseline (APB). Craft weight, to include payload and margin requirements, is a Technical Performance Measure (TPM) tracked by the PMO and is a design challenge as subsystem and components are selected. Following the June Integrated Baseline Review, the contractor is proposing adjustments to its performance measurement baseline schedule that are aligned with the expected system and subsystem detail design product development required for craft construction. DASD(SE) will review the product baseline artifacts and readiness for the Critical Design Review (CDR) in FY 2014.

- **Risk Management** – The program is executing a Risk Management Plan that is integrated with the contractor's risk management process to identify, track, and mitigate risk. Risk mitigation plans are in place for drivetrain integration, main engine development, C4N control system software development, and concurrency of craft construction with integration and test activities.

- **Performance** – Craft design is expected to meet the KPPs, KSAs, and TPMs identified in the SEP. The results of the Survivability (Seaworthiness) KPP scale model demonstrations indicate wave loadings are within the design limits of the craft.

- **Schedule** – The program achieved MS B in June 2012, and MS C is scheduled for FY 2015. The program schedule is lagging about 3 months due to slower-than-expected post-award contractor ramp-up. The Production Readiness Review is the next APB milestone and is expected to occur within its threshold date.

- **Reliability** – The program is following a phased craft-level reliability growth strategy. System-level reliability demonstrations will commence after delivery of the first craft in FY 2017. A closed loop Failure Reporting, Analysis, and Corrective Action System will document any resulting problems, and the Failure Mode, Effects, and Criticality Analysis will determine the corrective actions.

- **Software** – The majority of software development and integration is associated with the C4N subsystem. The software build plan prioritizes development complexity and will provide three releases to support craft integration and risk reduction activities. Software tracking metrics will be defined and finalized at the Software PDR in FY 2014.

- **Manufacturing** – The contractor will integrate all design engineers with the manufacturing teams to address the design-for-manufacturability plans. Eight production initiatives have been proposed that have the potential to reduce construction man-hours by 3 percent by way of product model improvements, new fabrication techniques, and automated assembly processes.

- **Integration** – The System Integration Lab (SIL) will provide an environment for hardware and software risk reduction. The C4N subsystem will be integrated and tested at the SIL. The contractor developed an interface matrix that identifies all major subsystem functional and physical interfaces.

Conclusion: The program is executing to plan and is on track to complete detail design and start first craft fabrication in FY 2014.

Data as of 4th quarter FY 2013.

SSN 774 VIRGINIA Class Submarine (VCS)

Prime Contractor: General Dynamics, Electric Boat (EB) Division; Huntington-Ingalls Industries (HII), Newport News Shipbuilding

Executive Summary: The VCS is a multi-mission nuclear-powered attack submarine optimized for littoral and open ocean operations. VCS replaces the aging LOS ANGELES Class of submarines which are systematically being decommissioned. The program is in the Production and Deployment phase, with 10 of 30 planned ships delivered. DASD(SE) completed an independent review of the reliability growth assessments (RGA) for the Large Area Bow (LAB) Array, VIRGINIA Payload Tubes (VPT), Common Weapons Launcher (CWL), and Payload Support Electronics System (PSES) Block III design changes.

Mission and System Description: The VCS was developed to conduct covert littoral and open-ocean operations in support of the following submarine mission areas: strike warfare; antisubmarine warfare; intelligence, surveillance, and reconnaissance; antisurface ship warfare; naval special warfare; mine warfare; and battle group operations. VCS is a nuclear-powered, deep-diving attack submarine that incorporates new technologies and increased stealth. Armament includes MK48 advanced capability torpedoes and vertical-launch cruise missiles.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2012 to support Block III and IV reduction of total ownership cost (RTOC) initiatives. The SEP includes a reliability program plan for the major Block III design changes. A SEP update is expected in FY 2014 to support early SE design activities associated with Block V. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The program has an approved Operational Requirements Document (ORD) (Revision A, Change 2) dated October 27, 2009. The ORD requirements are essentially unchanged through Block IV and all KPPs have been demonstrated. A VIRGINIA Strike Capability Change CDD is in review. The CDD provides additional strike warfare requirements, which the new Block V VIRGINIA Payload Module engineering change is designed to achieve. JROC approval of the CDD is anticipated in FY 2014, with a Block V construction start in FY 2019.
- **Life Cycle Management** – Block III implements design-for-affordability (DFA) changes to reduce unit acquisition cost. The first Block III ship will be delivered in 2014. The Block IV contract, planned for award in FY 2014, will incorporate RTOC engineering changes intended to improve operational availability by decreasing depot maintenance periods from four to three with little to no increase in acquisition costs. These initiatives will increase the operational availability and enable one additional deployment over a ships service life. The baseline design includes a life of ship reactor eliminating the expensive mid-life refueling overhaul.
- **Program Protection Plan (PPP)** – The program completed a Service-approved information assurance threat/vulnerability/risk mitigation study prior to the current PPP requirement. The program is in FRP, and the development of a new PPP by the program is not planned at this time.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed an independent review of the RGAs for the following Block III unique subsystems; VPT, CWL, PSES, and the new LAB Array. The RGA reports compared laboratory data and metrics to models and predictions. Laboratory metrics exceeded predictions for all of these subsystems. The RGA reports were comprehensive and revealed no significant reliability deficiencies for the electronic subsystems evaluated. DASD(SE) conducted independent quarterly Defense Acquisition Executive Summary assessments to inform OSD leadership and provide staff oversight.

- **Risk Assessment** – The program is executing its risk assessment and management process as documented in the SEP. The risk process integration team provides quarterly reports to the program management team, which then allocates resources as required to mitigate active risks within the program's assigned budget. Risks associated with the VPT, CWL, PSES, LAB Array, and new shaft design are all being addressed and mitigated.

- **Performance** – The program has achieved all 18 KPPs and is in FRP. There are no significant design issues affecting performance. The planned Block upgrades are intended to reduce the cost for each ship built to the goal of $2 billion (FY05$) per ship starting in FY 2010.

- **Schedule** – The FRP Acquisition Decision Memorandum was signed on September 3, 2010. The tenth ship of the Class (SSN 783) was delivered in June 2013, 10 months ahead of the contract delivery schedule. The first Block III ship, SSN 784, completed float off in September 2013 and is expected to deliver in early 2014, and will deliver early to its contract delivery date.

- **Reliability** – Special hull treatment de-bonding has been a ship Class design issue. The root cause was determined and process improvements to mitigate the issue have been retrofitted on all delivered ships, with full process implementation put on contract and cut into construction on the SSN784. Initial verification during sea trials for this ship is expected in the summer of 2014. Laboratory data collected to date reveal no significant reliability deficiencies for the VPT, CWL, PSES, and new LAB Array electronics for the Block III major design changes.

- **Software** – The majority of software development and support is associated with the Non-propulsion Electronics Systems (primarily in the Combat System, Sonar, and Common Submarine Radio Room subsystems). These subsystems are managed by Participating Acquisition Resource Managers (PARM). Functional Requirement Documents (FRD) and Ship Project Directives (SPD) establish the requirements and responsibilities between the PMO and PARMs. FRDs and SPDs are updated for each block buy of ships and reissued to the PARMs. The PMO does not maintain a consolidated set of software metrics but relies on individual PARMs to maintain their own metrics.

- **Manufacturing** – EB builds the pressure hull structural sections, and then EB and HII employ modular construction techniques to repetitively build their designated sections. The shipbuilders alternate the final assembly, outfitting, and delivery with EB delivering even numbered hulls and HII delivering odd numbered hulls. This approach improves each builder's learning curve, quality, reduces sources of rework, and progressively improves delivery schedules. To date, ship delivery has been reduced from 85 to 62 months and Block III deliveries are anticipated to further reduce the construction schedule below the 60-month goal.

- **Integration** – The NPES subsystems are integrated and certified at a Command and Control System Module Off-Hull Assembly and Test Site (COATS). PARMs perform integration testing at COATS prior to installations on the ship. This process has been embraced as a best practice for the integration of complex systems.

Conclusion: The program is on track, building two ships per year, and delivering progressively ahead of contract schedule. It is anticipated that Block III deliveries will meet and exceed the program's 60-month goal.

Data as of 4th quarter FY 2013.

Standard Missile-6 (SM-6)

Prime Contractor: Raytheon Missile Systems

Executive Summary: SM-6 is an extended-range active missile (ERAM) surface-to-air supersonic missile launched from Aegis cruisers and destroyers. SM-6 is in the Production and Deployment phase. In FY 2013, DASD(SE) conducted a Focused Review with the SM-6 program office and stakeholders to assess production readiness and to ensure processes, data, and models are in place to demonstrate the required operational reliability to support the FRP decision in May 2013.

Mission and System Description: The SM-6 ERAM is a surface-to-air supersonic missile, launched from Aegis cruisers and destroyers, capable of successfully engaging manned and unmanned, fixed-wing or rotary-wing aircraft, and land attack or anti-ship cruise missiles in flight. It is designed to provide ship self-defense, fleet area defense, and theater air defense for sea and littoral forces. SM-6 is an integration of the SM-2 Block IV/IVA airframe, flight control systems, ordnance, and propulsion stack with a modified Advanced Medium Range Air-to-Air Missile (AMRAAM) active seeker that provides dual-mode (active/semi-active) performance in benign and electronic attack environments with the support of the Aegis Weapon System (AWS).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SM-6 SEP in June 2009 to support MS C. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the SM-6 CPD in December 2008. The program requirements are stable and reasonable. The program has demonstrated traceability of requirements from the CPD to the missile specification and missile component specifications.
- **Life Cycle Management** – The program is developing a portable all-up round built-in-test set (PABT). PABTs will impact SM-6 maintenance time and cost savings over the life cycle by permitting the recertification of missiles at weapons stations vice returning missiles to the production facility for recertification. Life cycle savings are not expected to be realized until FY 2017.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP for MS C in February 2009. The program submitted an updated PPP for the FRP decision in May 2013 but DASD(SE) returned comments to strengthen the planning for supply chain risk management at the subcontractor level.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a Focused Review to assess the program's readiness to proceed to FRP in May 2013. As part of the Focused Review, DASD(SE) participated in the Production Readiness Review in December 2012. A key subject of the review was the shift of production to a new facility in Huntsville, Alabama. The results of the Focused Review indicate the program has effective production management processes to support FRP.

Data as of 4th quarter FY 2013.

- **Risk Assessment** – The program is managing risks according to the Risk Management Plan and SEP. The program is mitigating risks associated with parts obsolescence and system performance in specific electronic attack scenarios.
- **Performance** – The SM-6 program has five KPPs: down range, radar cross-section, single-shot kill probability, launch availability, and interoperability. The program demonstrated radar cross-section and single-shot kill probability before FRP. The program is on track to demonstrate the maximum down range, launch availability, and interoperability KPPs during Follow-On Operational Test and Evaluation (FOT&E) when the updated AWS Baseline 9 software is available in FY 2014. The launch availability KPP requires shipboard storage of missiles and is on track to be demonstrated in FY 2014 following authority to load SM-6 missiles on ships.
- **Schedule** – The FRP was conducted in May 2013. The SM-6 program has exceeded the initial Acquisition Program Baseline (APB) schedule threshold dates by 17 months for FRP (December 2011) and 24 months for Initial Operational Capability (September 2011). These delays were the result of extending the Developmental Test period in order to demonstrate design fixes for anomalies found during initial flight testing. A revised APB was approved in August 2013. The program is on track to meet the schedule thresholds in the revised APB. The program has completed all the Systems Engineering Technical Reviews in the approved SEP.
- **Reliability** – SM-6 flight reliability is a derived requirement in the missile specification from the single-shot kill probability KPP. The program is meeting the flight reliability requirement but with limited statistical confidence. The program has implemented and demonstrated reliability improvements including a new design for the missile communication link antenna housing to eliminate the causes of previous failures seen during Initial Operational Test and Evaluation (IOT&E). The program will conduct flight test during FOT&E to continue to build statistical confidence for meeting the missile reliability requirement.
- **Software** – The program completed all software development to support FRP and planned FOT&E. The program has plans for software modifications to enhance system performance to address a specific limitation seen during IOT&E. Future upgrades to the missile software can be applied at the AUR level using the test sets at the production facility or with PABTs when they are available for use.
- **Manufacturing** – The program completed a Production Readiness Review in December 2012 at which the AUR and each of its major subassemblies were assessed as having met FRP manufacturing requirements. The program has delivered LRIP missiles on schedule and is on track to meet planned FRP rates. The program has certified the readiness of the new production facility in Huntsville to support FRP and has started delivery of LRIP-3 AURs from the new facility.
- **Integration** – The SM-6 AUR integration with the MK41 vertical launching system (VLS) was demonstrated during IOT&E. Initial SM-6 capabilities were provided with the AWS Baseline 7.1R to support IOT&E. Full SM-6 capabilities are provided with AWS Baseline 9. The program is on track to demonstrate the SM-6 maximum down range and interoperability KPPs in FY 2014 during SM-6 FOT&E on a AWS Baseline 9–equipped ship. The SM-6 missile is a key component of the naval integrated fire control-counter air capability.

Conclusion: The SM-6 program is on track to successfully execute FRP. Planned FOT&E is required to demonstrate three KPPs.

T-AO(X) Fleet Replenishment Oiler

Prime Contractor: TBD

Executive Summary: The T-AO(X) program will replace the legacy T-AO 187 Class fleet replenishment oilers and provide the primary means to supply fuel from logistics nodes ashore to Navy ships and their embarked aircraft. The program is pre-Engineering and Manufacturing Development (EMD). DASD(SE) participated in working-level meetings and the OIPT that led to an Acquisition Decision Memorandum (ADM) dated April 5, 2013, authorizing entry into the acquisition system at MS B.

Mission and Description: The Navy requires replenishment oiler capabilities to support Fleet operations across the full range of military operations. T-AOs will act as both shuttles between resupply ports and customer ships, and as station ships accompanying and remaining on-station with a Carrier Strike Group or an Amphibious Ready Group to provide fuel oil and stores as required. T-AO(X) will provide Navy standard CONREP and VERTREP capabilities and will provide turnkey commercial off-the-shelf C4I (command, control, communications, computers, and intelligence) subsystems equivalent to existing platforms. Ship protection and self-defense will be provided by other fleet assets.

Systems Engineering Activities:
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the program SEP in April 2013, which supports industry studies and program activities leading to the Pre-EMD review in FY 2015. The program is fulfilling the objectives of the SEP with no waivers or deviations.
- **Requirements** – JROC approved the Initial Capabilities Document in January 2011. The Navy approved the CDD dated November 2012, which identifies five KPPs and 13 KSAs. The program requirements are reasonable and stable, and no additional technology development is planned.
- **Life Cycle Management** – The ADM of April 5, 2013, established affordability cost targets [caps] for acquisition and Operations and Support. The program is executing early systems engineering activities, industry studies, and trade-off analyses to identify opportunities to reduce total ownership costs. The program has a Sustainment KPP that requires each ship to be Ready-for-Tasking (RFT) at least 270 days per year. The program will use the Military Sealift Command's proven structure for T-AO(X) life cycle management and sustainability as the basis for design validation.
- **Program Protection Plan (PPP)** – The program has a Service-approved PPP dated February 2013. The program will update the PPP to support MS B.

Assessments:
- **DASD(SE) Assessments** – DASD(SE) completed a Program Support Review (PSR) to inform the OIPT and USD(AT&L) of the program's technical risks, engineering and management processes, and readiness to enter the next phase of the acquisition system. The program adopted a majority of the PSR recommendations to include the development of a strategy to collect

Data as of 4th quarter FY 2013.

reliability data during ship construction. Technical Performance Measures and metrics documented in the SEP will be updated and tracked as the program matures.

- **Risk Assessment** – The program is following its Fleet Replenishment Oiler (T-AO(X)) Risk, Issues and Opportunities (RIO) Management Plan (MP). This RIO MP was produced based on DoD risk management guidance and commercial best practices in both risk and opportunity management.
- **Performance** – Industry trade-off study contracts are investigating ship systems and alternative subsystem designs for energy efficiency, reliability, and cargo handling efficiency to satisfy the CDD requirements. The most favorable design attributes will be incorporated into the system specification. The program is on track to achieve its five KPPs and 13 KSAs as specified in the CDD.
- **Schedule** – The program received a Materiel Development Decision in late February 2011. Preparations for a MS A DAB in March 2013 identified that the program required no technology development, and entry into the acquisition system at MS B was authorized by ADM on April 5, 2013. Efforts to complete the industry studies, system specifications, and indicative design are on track to support a Pre-EMD Review and RFP release in FY 2015.
- **Reliability** – The program developed a RAM-C Rationale Report dated February 20, 2013. Current oiler class ships have been available for tasking in excess of 270 days a year, which makes Days RFT a key performance measure. The RAM-C analysis equates 270 Days RFT to an Operational Availability Based on Critical Failures (AOCF) of 0.95, and equivalent to a ship-level 600-hour mean time between critical failure. The industry trade studies will identify system reliability and proposed redundancy to minimize any failure impacts to mission capability.
- **Software** – Software development for the HM&E (hull, mechanical, and electrical) systems is expected to be minimal since the Machinery Control System and Integrated Bridge System software is delivered as a turnkey Original Equipment Manufacturer product. The C4I subsystems will be provided as Government-furnished equipment by a participating manager, and the program office will have little to no software development responsibilities.
- **Manufacturing** – The program will conduct trade studies of alternatives in the areas of main machinery, liquid/solid cargo stowage and handling, and energy conservation. Three shipyards, capable of designing and building this class of ships, received awards for the studies and manufacturing aspects for their facilities. The results will address both design and production considerations, which will be incorporated into the ship indicative design.
- **Integration** – Industry study contracts include options to perform an integration study to analyze selected systems, equipment, and approaches into individual concepts to identify potential compatibility issues or impacts. No external dependencies or interface agreements are identified in the SEP for this phase of the program.

Conclusion: The T-AO(X) program is maturing the indicative design, system specification, and Detail Design and Construction RFP and is on track to release the RFP following the Pre-EMD Review in FY 2015.

Data as of 4th quarter FY 2013.

Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS)
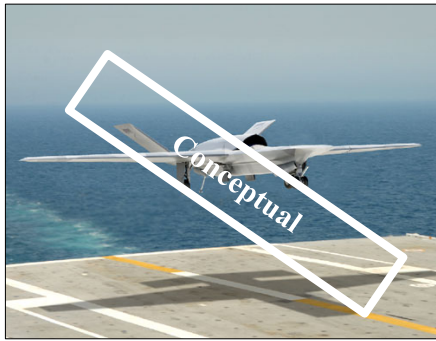
Prime Contractor: To be determined

Executive Summary: The UCLASS system will provide persistent surveillance and strike capability. The program will enter the acquisition cycle at the Technology Development (TD) phase in FY 2015 to develop, integrate, and test the UCLASS system. The program has awarded four preliminary design contracts, which will inform a follow-on full and open competition for a TD contract. The Government will act as the lead system integrator. In FY 2013, DASD(SE) assisted the program in improving its development strategy and integration efforts documented in the Technology Development Strategy (TDS) and draft Systems Engineering Plan.

Mission and System Description: The UCLASS will provide persistent surveillance and strike capability to support missions in permissive counterterrorism operations, to missions in contested environments, to providing enabling capabilities for high-end contested environments, to enabling capabilities for high-end denied operations, as well has supporting organic Naval missions. The system consists of three segments: the Air Segment (AS), the Carrier Segment (CVN), and the Control System and Connectivity Segment (CS&C). The program plans to incrementally increase capability. The baseline requirements to reach Early Operational Capability within 3 to 6 years include: persistence; intelligence, surveillance, and reconnaissance; weapons carriage; data distribution; and carrier operations.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The program has a draft SEP that will be matured to support MS A in FY 2015. The SEP outlines the technical approach as applied to the prime contractor(s) and the Government team, and defines the Government's role as the lead system integrator. No waivers or deviations are expected.
- **Requirements** – The JROC approved the Initial Capabilities Document in June 2011 and USD(AT&L) approved the TDS in June 2013. The Navy approved a draft CDD in April 2013. The baseline requirements, along with provisions for capability growth as defined in the CDD, were decomposed to an operational Air Systems Performance Specification (ASPS) and provided to four contractors to design to and complete their Preliminary Design Reviews (PDR). The PDRs will largely determine the likelihood of each AS to meet the CDD requirements.
- **Life Cycle Management** – In a December 2012 memorandum, the JROC emphasized affordability as the number one priority for the program. The CDD established an affordability KPP in which the recurring fly-away cost of the air vehicles to conduct one 600 nautical mile orbit shall not exceed $150 million. Available funding to complete system development is also limited, pressuring industry to provide mature systems and emphasize cost during development.
- **Program Protection Plan (PPP)** – The PPP is in development. The program plans to submit the PPP for approval to support MS A in 2nd quarter FY 2015. Key elements of system protection requirements will be evaluated at the technical reviews during the PDR contracts.

Assessments
- **DASD(SE) Assessments** – DASD(SE) provided input to the program TDS to improve the level of technical rigor and risk analysis to be completed during program development. The program

Data as of 4th quarter FY 2013.

conducted rigorous planning to ensure the contractor PDRs are complete and not abbreviated when compared with PDRs conducted for other MDAPs consistent with the policies specified in DoD Instruction 5000.02. DASD(SE) participated in planning and decision meetings through which the program awarded the four PDR contracts. DASD(SE) participated in one contractor System Requirements Review (SRR) in FY 2013 and will participate in the remaining three SRRs and additional technical reviews leading to the PDRs in FY 2014.

o In FY 2014 DASD(SE) will conduct four contractor PDR assessments to evaluate each proposed design's ability to meet the program requirements. DASD(SE) will assess the risk associated with additional and new capability additions.

- **Risk Assessment** – The program has an approved risk management process and plan. The program has completed an initial risk assessment based on market research, industry input, and lessons learned from similar programs. The program has identified key risks in the areas of: system-of-systems integration, the Joint Precision Approach and Landing System (JPALS) fielding schedule, Common Control Station development schedule, and the ability to meet the system requirements within the established budget.

- **Performance** – The draft CDD has six KPPs and six KSAs that delineate total system (AS, CVN, CS&C) performance. The draft SEP has a notional set of Technical Performance Measures (TPM) to which each PDR contractor may propose modifications. The program will approve a final set of TPMs to monitor technical performance to plan. Predicated and/or demonstrated AS performance will be evaluated and reported in the PDR assessments in FY 2014.

- **Schedule** – The program has established a detailed schedule to complete the four contractor PDRs. The schedule-driven technical reviews will evaluate each contractor design "as is." The requirement to deliver a deployed capability in 3 to 6 years means there is little or no schedule available for new development or significant changes to existing designs. Schedule risk will be evaluated at each technical review and reported in the PDR assessment.

- **Reliability** – The program used historical and predictive reliability and maintainability metrics to inform an estimated time-on-station model that predicts performance of the persistence KPP. A set of reliability requirements feed this model and are included in the PBS. The draft CDD and draft SEP include additional suitability-related reliability requirements and TPMs.

- **Software** – The three system segments will leverage existing software and also will require new software development. Software from the UCAS-D program will be available to all contractors. The extent of required development is contractor dependent and will be assessed during the PDRs.

- **Manufacturing** – The program has assessed the potential contractors as capable of producing the air vehicle based on their experience manufacturing fielded unmanned systems. The program will draw on industrial capability from ongoing DoD and contractor efforts.

- **Integration** – The program must integrate the three major segments and relies on more than 20 existing in-service, deployed systems. The program has developed Interface Requirements Specifications between the aircraft and the segments/programs using an approved DoD Architectural Framework. Multiple Integrated Product Teams will coordinate information exchange requirements and manage the integration activities across the AS, CVN, and CS&C segments.

Conclusion: The UCLASS program has begun technical evaluation of four contractor preliminary designs. The acquisition strategy is to enter a Technology Development phase and follow-on contract after completion of the PDRs, with a MS B or C in 1st quarter FY 2021. The PDR assessments will document the risk and likelihood of each of the current system's ability to achieve the user-defined requirements within the required budget and schedule constraints.

Data as of 4th quarter FY 2013.

4.3 DASD(SE) Assessments of Air Force Programs

Assessments are as of 4th quarter FY 2013. This section includes summaries on the following 11 programs:

- Air and Space Operations Center–Weapon System, Increment 10.2 (AOC-WS Inc 10.2)
- B-2 Defensive Management System Modernization (B-2 DMS Mod)
- B61 Tailkit Assembly (B61 TKA)
- Combat Rescue Helicopter (CRH)
- Enhanced Polar System (EPS)
- F-22A, Increment 3.2B Modernization (F-22A Inc 3.2B Mod)
- Global Positioning System (GPS) Enterprise
- Joint Space Operations Center (JSpOC) Mission System (JMS)
- KC-46 Aerial Refueling Tanker (KC-46A)
- Small Diameter Bomb, Increment II (SDB II)
- Three-Dimensional Expeditionary Long-Range Radar (3DELRR)

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Air and Space Operations Center–Weapon System, Increment 10.2 (AOC-WS Inc 10.2)

Prime Contractor: Northrop Grumman Information Systems

Executive Summary: AOC-WS Inc 10.2 will integrate more than 40 disparate third-party mission applications into a net-centric structure, automating mission processes through a single user interface. The program initiated Technology Development (TD) risk-reduction activities in January 2012 and met MS B in August 2013. Through a Focused Review and Preliminary Design Review (PDR) assessment, DASD(SE) assessed that the program performed pre-Engineering and Manufacturing Development (EMD) risk reduction actions as directed by the Acquisition Decision Memorandum (ADM) and met MS B technical entrance criteria.

Mission and System Description: The AOC-WS is the Combined and Joint Force Air Component Commander's weapon system for planning, executing, and assessing theater-wide air operations. The AOC-WS Inc 10.2 establishes a common service-oriented and standards-based infrastructure to integrate mission systems and services developed by third-party capability providers outside of the AOC-WS program. The AOC-WS 10.2 infrastructure employs the fielded AOC-WS 10.1 hardware, virtualized applications, and thin servers/clients. It enables a common user interface, provides modular applications with standard interfaces and shared data to support agile integration and rapid fielding of future capabilities, and should increase the speed of command.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS B SEP in August 2013 and directed the program to establish system performance measures not later than 60 days before Critical Design Review (CDR), planned for FY 2014. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the CDD in October 2006 and approved an update in December 2009. The requirements are traceable through the Technical Requirements Document and Release Specification to 45 subsystem design documents. The program reduced requirements and technical risk by incorporating user feedback during the TD phase via monthly demonstrations and Warfighter assessments at the conclusion of each software build.
- **Life Cycle Management** – The program successfully reduced will-cost estimates by developing nine should-cost initiatives, including a plan to save $24 million by refining mission thread automation phasing. The program has identified reduction of total ownership cost (RTOC) as a KSA. The contractor presented a methodology at the PDR to address total ownership cost (TOC) and recommended the program focus on two main cost drivers (operations personnel and software licensing).
- **Program Protection Plan (PPP)** – The MS B PPP has been signed by the Air Force and is in OSD stakeholder coordination toward FY 2014 approval. The program is addressing residual critical program information protection actions.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) assessed AOC-WS Inc 10.2 during FY 2013 through a Focused Review, PDR assessment, supported a Critical Change Review (CCR) and ADM-directed Independent Risk Assessment. DASD(SE) determined that the program reduced full-scale integration risk, mitigated technical risks, met MS B technical entrance criteria, and was prepared to proceed to EMD. DASD(SE) proposed mitigation of three primary risks (software development schedule, software process rigor, and system performance measures) necessary for successful EMD.
- **Risk Assessment** – The program is executing risk management planning as documented in the SEP and is working to mitigate risks associated with software development schedule, rigor of field-ready software processes, and end-to-end system performance measures.
- **Performance** – The program projects the design will meet all KPPs and Technical Performance Measures (TPM) documented in the SEP; however, the program lacks an end-to-end performance strategy, which could impact preparedness for verification and validation. DASD(SE) has requested the program update the SEP with system performance measures before the FY 2014 CDR.
- **Schedule** – The program successfully met MS B in August and plans MS C for June 2015. The program is emerging from a CCR, triggered by the program's inability to meet the 5-year fielding requirement, and is now on track to meet the Acquisition Program Baseline (APB) threshold dates and its FY 2014 CDR. DASD(SE) analysis showed the mission thread implementation effort to be 6 months behind schedule, and the program subsequently altered its implementation schedule, reduced scope of the effort, and improved metric reporting to mitigate this risk.
- **Reliability** – The program is on track to meet the reliability requirement. The program applied DASD(SE) recommendations to focus on operational availability, improve software quality, and develop an essential functions list.
- **Software** – The program has developed a series of viable software development metrics and is on track to achieve requirements by the APB-directed dates. The program is developing approximately 45,000 lines of integration code in five progressive builds. The program's "field the prototype" strategy requires tighter controls for EMD execution as user feedback resulted in unplanned work. The program acted on recommendations to strengthen processes and external agreements to properly qualify software for fielding.
- **Manufacturing** – The program will employ the commercial off-the-shelf/Government off-the-shelf hardware fielded with Inc 10.1; therefore, manufacturing concerns are minimal.
- **Integration** – Previous analysis remedied integration disconnects. The program enacted DASD(SE) recommendations to prioritize 40-plus mission applications for integration, map the effort to requirements and mission threads, incorporate user feedback, and update obsolete support agreements with external technical organizations by CDR.

Conclusion: AOC-WS Inc 10.2 developed a TD phase approach that reduced full-scale end-to-end integration risk, performed viable risk-mitigation actions, met MS B technical entrance criteria, and was prepared to proceed to EMD. The program is taking action to mitigate risks in the areas of software development schedule, rigor of "field-ready" software processes, and end-to-end system performance measures to enhance its success in EMD.

Data as of 4th quarter FY 2013.

B-2 Defensive Management System Modernization (B-2 DMS Mod)

Prime Contractor: Northrop Grumman Aerospace Systems

Executive Summary: The B-2 DMS Mod is a major upgrade to replace the legacy DMS receivers, antennas, and display processor. The modernization will improve the B-2's ability to detect, identify, geo-locate, and avoid threats, significantly enhancing aircrew situational awareness. The B-2 DMS Mod is an ACAT ID program in the Technology Development (TD) phase. DASD(SE) conducted a deep dive assessment in April 2013 on the antenna subsystem and a Program Support Review (PSR) in May 2013.

Mission and System Description: The B-2 is an all-wing, two-person-crew aircraft with twin weapons bays capable of carrying a 20,000 pound or more bomb load. The aircraft is a multi-role, low-observable bomber capable of delivering conventional and nuclear munitions. The B-2 is tasked to attack global targets, day or night, in all weather and in highly defended threat areas at the strategic, operational, and tactical levels of warfare. The B-2 DMS is a principal enabler for survivability for the B-2 stealth bomber. The legacy Threat Emitter Locator System (TELS) detects, identifies, and locates enemy radar systems and facilitates real-time threat avoidance by providing threat warning and threat situational awareness information to the aircrew via the Tactical Situation Display. The B-2 DMS Mod will replace TELS and its associated antennas with a more current Electronic Support Measure (ESM) subsystem for improved threat detection and an expanded aircraft display processing system to increase situational awareness.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS A SEP in August 2011, which will guide technical planning and execution through TD. The program is fulfilling the objectives of the SEP without waivers or deviations. The program is preparing a SEP update to support MS B in 2015.
- **Requirements** – The program requirements derive from the 2009 Electronic Warfare Initial Capabilities Document and the 2010 Airborne Strategic Deterrence Initial Capabilities Document. The Director, Cost Assessment and Program Evaluation approved the Analysis of Alternatives in March 2011. The JROC approved the CDD in April 2013.
- **Life Cycle Management** – The B-2 DMS Mod will emphasize reliability in the design process in order to reduce total ownership cost. To achieve USD(AT&L) Better Buying Power initiatives, the program is including maturity incentives in the contract.
- **Program Protection Plan (PPP)** – The B-2 DMS-Mod has a draft PPP that stands alone from the platform.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a PSR of the B-2 DMS Mod program in FY 2013. Throughout the TD phase, focus areas include software development, low-band radio frequency (RF) receivers, and aperture maturation. DASD(SE) conducted a technical deep dive assessment in April 2013 to determine the scope of the remaining development and to assess

Data as of 4th quarter FY 2013.

technical maturity and verification needed to mitigate outstanding risks in the TD phase. The program has developed a plan to include antenna pole testing prior to MS B.

- **Risk Assessment** – The program is executing its risk management planning as documented in the SEP. At the May 2013 PSR, DASD(SE) assessed the B-2 DMS Mod program as having risk in the areas of software, hardware, integration, and verification.
- **Performance** – The program is on track to meet the KPPs and KSAs as well as the Technical Performance Measures documented in the SEP.
- **Schedule** – MS A was conducted in June 2011. MS B is scheduled for 2015. An Acquisition Program Baseline that documents an updated schedule will be developed at that time. Initial Operational Capability is expected in FY 2018. A Preliminary Design Review is scheduled for March 2014. Antenna maturation and performance assessments need to be completed to support MS B. Test asset availability based on fleet size and competing priorities put additional stress on the program's ability to meet upcoming milestones.
- **Reliability** – The B-2 DMS CDD contains two materiel reliability KSAs based on mission reliability and mean time between maintenance. The program expects to achieve these requirements by FRP in FY 2020. In addition, the program's SEP includes reliability growth planning and the contract requires design for reliability tasks.
- **Software** – As part of the PSR, DASD(SE) participated in a software assessment that highlighted software development as a key program risk. There is limited margin in the engineering version of the software build schedule. The program has made this an area of emphasis, and the program has revised the Software Development Plan to address shortfalls and details of the software prototyping strategy.
- **Manufacturing** – The ESM and display solutions will leverage fielded systems and systems already in development, so the program does not expect significant manufacturing risk. The SEP reflects program plans to assess manufacturing readiness throughout the life cycle during all Systems Engineering Technical Reviews and in support of major milestones. The program will develop a Manufacturing Maturity Plan to support the PDR.
- **Integration** – The B-2 DMS program has identified a risk related to ESM/antenna integration. The program selected a two-phase TD phase approach as a risk mitigation to allow the selected ESM contractor to optimize the overall system and reduce integration risk by defining interfaces and subsystem allocations to support down-selection of critical ancillary subsystems (e.g., antennas, fiber/cable network, and displays).

Conclusion: The B-2 DMS-Mod program is progressing through the TD phase. Software development and maturation of the low-band RF receiver processor and antennas are known challenge areas. The program plans to address these areas in the TD and Engineering and Manufacturing Development phases.

B61 Tailkit Assembly (TKA)

Prime Contractor: The Boeing Company

Bomb Assembly (BA) Tailkit Assembly (TKA)
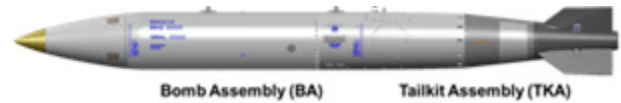
Executive Summary: The life extension of
the B61-12 (B61) ensures the United States and its allies will continue to have nuclear deterrence options provided by the B61 in the future. The B61 Tailkit Assembly (TKA) is an ACAT ID program in the first of two Engineering and Manufacturing Development (EMD) phases. The USD(AT&L) approved a two-phase EMD program with an option for the second phase to incentivize unit pricing at or below design-to-unit-cost goals. The second phase begins after Critical Design Review. The DASD(SE) participated in the April 2013 System Requirements Review (SRR) and the May 2013 System Functional Review (SFR).

Mission and System Description: The TKA provides weapon-delivery accuracy to achieve the desired operational effects of the B61. The TKA enables consolidation of multiple bomb assembly (BA) modifications (-3/4/7/10) into a single all-up round (AUR), the B61-12, reducing the number of life extension programs and life cycle costs for both the DoD and the Department of Energy (DOE). The goal of the multi-agency B61 program is to extend the life of the weapon while modernizing within existing capabilities as directed by the Nuclear Weapons Council and documented in the June 2008 Tasking Memorandum. The AUR consists of two major assemblies: the BA developed and managed by the DOE, and the TKA developed and managed by the DoD.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the TKA SEP in September 2012 in support of the November 2012 MS B DAB. The program is updating the SEP to support the 1st quarter FY 2014 Preliminary Design Review (PDR). The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved the TKA MS B CDD in September 2012 and the top-level requirements are reasonable and stable. The May 2013 SFR validated the requirements traced from the CDD to the System Requirements Document (SRD) and to the Boeing System Performance Specification (SPS). However, the program office is still working an action from the SFR to ensure the draft BA-to-TKA Interface Control Document (BTICD) and the Platform-to-System ICD align with the CDD, SRD, and the SPS.
- **Life Cycle Management** – The design takes extended service life components into consideration to allow the program to meet AUR service life requirements without costly and time-consuming recertification. In addition, design-to-unit-cost is on contract.
- **Program Protection Plan (PPP)** – USD(AT&L) deferred the MS B PPP until 30 calendar days after PDR.

Assessments
- **DASD(SE) Assessments** – DASD(SE) did not conduct any formal systems engineering assessments in FY 2013; however, the team participated in the April SRR and May SFR.
  - At both the SRR and SFR, DASD(SE) observed participation by all key organizations. At the SRR, DASD(SE) noted the lack of alignment among the approved CDD, SRD, and SPS and supported the program office decision to delay SFR until the requirements were properly aligned. The SRR resulted in more than 50 actions items. At the SFR, DASD(SE) stressed

Data as of 4th quarter FY 2013.

the critical dependency on the still draft BTICD and PSICD, and collaborated with the program office to make resolution a top priority among them, DOE, and Boeing.

- o DASD(SE) completed the first quarterly Defense Acquisition Executive Summary assessment in the areas of schedule, performance, management, interoperability, and production.
- o DASD(SE) plans to participate in the 1st quarter FY 2014 TKA PDR and will conduct a PDR assessment.

- **Risk Assessment** – The program is executing the risk management program documented in the SEP and draft Risk Management Plan. The program is mitigating 11 risks related to schedule, performance, production, integration, and cost.

- **Performance** – The program is on track to meet all 4 KPPs and 4 of 5 KSAs. The system will be challenged to demonstrate the Reliability KSA because of the limited number of developmental test flights. The program is also on track to meet 14 of 17 Technical Performance Measures (TPM) in the SEP. Built-in-test, minimum sustain spin rate, and weight exceed internally established margins (but not specification values) and present risk; mitigation plans are in place.

- **Schedule** – The program completed MS B in November 2012, and plans to begin EMD-2 in FY 2015 with MS C in FY 2017. Risks associated with concurrent DoD/DOE development activities have the potential to delay the TKA Acquisition Program Baseline (APB) schedule estimates from objective to threshold time frames, for MS C, FRP, and first production delivery. DASD(SE) schedule health assessment results were provided to the program office for incorporation into future IMS updates.

- **Reliability** – The TKA reliability requirements are in the CDD, and reliability growth planning is documented in the SEP. While the program is executing a rigorous reliability growth program, the short production cycle and limited test resources present risk to meeting the Reliability KSA. The program created contract incentives for high reliability during developmental testing and plans to conduct qualification and quality testing in EMD-2.

- **Software** – Software development is not expected to be a challenge based on experience with the development of similar capabilities.

- **Manufacturing** – At the May 2013 SFR, the program assessed manufacturing maturity as adequate for this phase of the program, with risk in the area of radiation hardening. Boeing is leveraging mature manufacturing processes from the Joint Direct Attack Missile and Small Diameter Bomb I systems but has not yet tailored the processes for different materials needed. Boeing has identified suppliers for most major components.

- **Integration** – The program is dependent on interagency coordination with DOE for weapon system development and test assets. The Air Force Nuclear Weapon Center (AFNWC) is responsible for AUR integration of the BA with the TKA, as well as aircraft integration on multiple U.S. and NATO aircraft. The TKA is also dependent on the industrial base for inertial guidance and radiation hardening. In addition, the program is dependent on the F-35A program for platform environmental, physical fit, and interface data. These interdependencies present technical challenges and will require close attention and development of well-defined interfaces and documentation (e.g., ICDs). The program is executing to a June 2012 memorandum of understanding (MOU) with the AFNWC, the DOE/National Nuclear Security Administration, the Air Armament Center, and the B-2, F-15E, F-16C/D, and F-35A program offices. The MOU identifies each organization's responsibilities with respect to development, production, and integration of the AUR.

Conclusion: The TKA program is executing to the proposed schedule, but risks associated with concurrent DoD/DOE development activities may delay TKA APB schedule objectives for MS C, FRP, and first TKA delivery.

Data as of 4th quarter FY 2013.

Combat Rescue Helicopter (CRH)

Prime Contractor: To be determined

Executive Summary: The CRH program will replace the Air Force's HH-60G Pave Hawk helicopter fleet with new air vehicles, training systems, and product support as required for the Personnel Recovery (PR) mission. The program released an RFP in October 2012 and is in source selection to procure an existing and proven medium-lift helicopter that integrates mature and available subsystems, avionics, and mission equipment. The program will enter at MS B to procure 112 aircraft. DASD(SE) completed a Program Support Review (PSR) in October 2012 to support the RFP release and MS B. The program has implemented several PSR recommendations to improve systems engineering planning and increase the focus on measuring technical performance.

Mission and System Description: The primary mission of the CRH aircraft is to recover isolated personnel from hostile or denied territory. CRH also will execute humanitarian missions, civil search and rescue, disaster relief, casualty/medical evacuation, and non-combatant evacuation operations. The CRH will be a dual-piloted, multi-engine, vertical takeoff and landing platform that will provide improved vertical lift capability along with command and control communications technology to meet Air Force PR mission requirements.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – The program has developed a SEP, which is on track for approval to support MS B, scheduled for 1st quarter FY 2014. The SEP contains a robust set of Technical Performance Measures (TPM) that will be used to track technical performance to plan throughout system development and integration. No waivers or deviations are expected.
- **Requirements** – The JROC approved the program CDD in July 2010. A July 2012 JROC memorandum revalidated the six KPPs and clarified 14 KSA requirements. The System Specification traces to the CDD and was included as an attachment to the RFP. The Acquisition Strategy (AS) limits the introduction of new technologies and focuses on the integration of existing systems into a proven air vehicle. The CRH requirements are reasonable and stable.
- **Life Cycle Management** – The program AS addresses affordability and cost reduction by the procurement of aircraft currently in production, the integration of existing systems, and the incorporation of a production affordability target in the RFP. The AS articulates that the program will identify, assess, and address any opportunities that will reduce Operations and Support costs. Should-cost initiatives will be identified at MS B and annually thereafter. Reliability and maintainability requirements and engineering activities are realistic and adequately defined in the RFP, SEP, and Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report.
- **Program Protection Plan (PPP)** – The program's RFP contained language to improve program protection, including anti-tamper planning. The PPP is in the approval phase to support MS B.

Assessments

- **DASD(SE) Assessments** – DASD(SE) conducted a PSR to inform the MS B decision and assist the program with the transition to the Engineering and Manufacturing Development (EMD) phase. The PSR determined that the program has a strong team with a robust systems engineering component that will enable them to proceed effectively to contract award. The

Data as of 4th quarter FY 2013.

review revealed a staffing risk post-contract award that the program is mitigating by increasing staffing in systems engineering and software management to support contract execution. The PSR also identified risks associated with concurrent production and integration, software development, and air vehicle performance and certification. DASD(SE) held two SE Working Integrated Product Teams and SEP and PPP reviews to assist the program in establishing a sound technical foundation and to prepare for the upcoming MS B.

- o In FY 2014, DASD(SE) will participate in the System Requirements Review (SRR) and Preliminary Design Review (PDR) and will conduct a PDR assessment.

- **Risk Assessment** – The program conducted an initial risk assessment of potential systems expected to be bid in response to the RFP and found moderate risk at this stage. The program recognizes that a minimally acceptable airframe would pose a performance risk, and the program is assessing all offers for subsystem space, weight, power, and cooling (SWaP-C) requirements. The program will establish a weight management program after contract award.

- **Performance** – The TPMs in the SEP are specific enough to provide meaningful tracking through system development and will be tailored to the specific airframe selected. The program is in source selection; therefore, actual system performance cannot yet be evaluated. However, procuring mature in-production systems significantly reduces performance risk.

- **Schedule** – The program is in the pre-EMD phase. USD(AT&L) held a Materiel Development Decision DAB in February 2012 and a follow-on In-Process Review DAB in May 2012 that approved release of a competitive aircraft procurement RFP. The RFP was released in October 2012, and the program remains in source selection. The program is scheduled to enter the acquisition cycle at MS B in 1st quarter FY 2014. Schedule thresholds will be established in the Acquisition Program Baseline. The SRR and PDR will be conducted approximately 3 and 9 months after MS B, respectively. The final program schedule will be determined at contract award.

- **Reliability** – System reliability requirements were developed based upon in-service aircraft capabilities and approved mission requirements. Reliability growth curves have been developed and will be used to evaluate reliability throughout system integration. Market research and existing data support the assessment that the requirements are achievable.

- **Software** – The program will not fully understand the complexity of software development until the proposals are evaluated and the SRR is complete. The scope of software development is dependent on the offerors' proposed system and is under evaluation in source selection. Software development schedule is identified as a critical path driver. The program plans to implement an incremental software development approach in combination with a quantitative tracking approach and will include baseline software metrics in the contract to mitigate the risk.

- **Manufacturing** – All expected offerors have existing production lines with sufficient capacity to support the planned CRH production levels. A Manufacturing Readiness Assessment was performed during source selection to identify the production readiness risks of each design.

- **Integration** – Concurrent EDM production and subsystem integration are anticipated to be the most challenging aspects of CRH program development. The program plans to ensure close management of the production line to avoid unplanned changes that could result from a late understanding of integration requirements for SWaP-C, wiring, and electro-magnetic shielding. The RFP requested that the contractor develop, implement, and maintain a Systems Integration Plan that addresses the system functional configuration and integration process.

Conclusion: The CRH program has made a dedicated effort to incorporate sound systems engineering into program planning to ensure the fielding of a desired solution that meets the user's performance requirements on cost and schedule.

Data as of 4th quarter FY 2013.

Enhanced Polar System (EPS)

Prime Contractor: Northrop Grumman

Executive Summary: The EPS program is the next
generation of communications satellites to provide
coverage in the North Polar Region, currently in the
Technology Development phase. DASD(SE) participated
in the EPS System Functional Review (SFR) in January
2013, the EPS Control and Planning Segment (CAPS)
Preliminary Design Review (PDR) in June 2013, the EPS
System PDR in August 2013, and the Gateway Segment
Critical Design Review September 2013. DASD(SE) has
worked closely with the EPS program office throughout
2013 to develop the program Systems Engineering Plan (SEP).
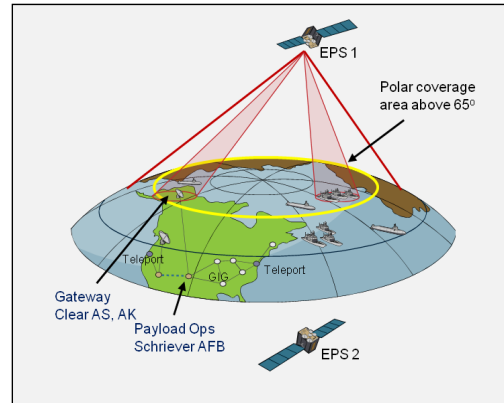
Mission and System Description: The mission of the EPS is to provide communications coverage
to users in the North Polar Region, above 65 degrees latitude. The system consists of two satellites
in high-inclination Molniya orbits, using an EPS payload integrated on a host satellite bus. EPS
payload design is based on a simplification of the Advanced Extremely High Frequency (AEHF)
payload and implements the Extended Data Rate (XDR) waveform. The system uses a stand-alone
tool for communications network planning developed as part of the CAPS. A terrestrial gateway
provides interoperability for midlatitude users through the Global Information Grid (GIG). This
architecture leverages a mature XDR payload-to-ground interface, austere CAPS and gateway
architectures that leverage Government-off-the-shelf (GOTS) and commercial-off-the-shelf (COTS)
hardware, and a common GIG connection standard.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the EPS SEP in September 2009. The
  SEP documents the program's technical planning for the Technology Development phase
  systems engineering activities. The program is fulfilling the objectives of the SEP without
  waivers or deviations. The program has prepared an update to the SEP for formal review and
  approval in early FY 2014.
- **Requirements** – The JROC approved the CDD in 2006. The CDD contains six KPPs. AFROC
  updated the CDD in 2011 with no KPP changes. The requirements are stable and reasonable.
  The program KPPs and Technical Performance Measures (TPM) were assessed at the EPS SFR
  in January 2013, the EPS CAPS PDR in June 2013, and the EPS System PDR in August 2013.
  At both PDR events, the program office demonstrated complete allocation and traceability of the
  program requirements into the program baseline. The program is on track to meet all
  requirements with margin.
- **Life Cycle Management** – The EPS program has a TPM targeting payload mean mission
  duration of 7 years. Currently, the program office estimates a 1.88-year margin against this
  TPM. This TPM was assessed at the System PDR. The program office performed several trade
  studies to examine cost-saving measures while defining the baseline architecture.
- **Program Protection Plan (PPP)** – The program is developing a PPP and will place the
  document into formal coordination in early FY 2014.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments** – DASD(SE) supported the EPS PDR in August 2013 and is finalizing a PDR assessment for USD(AT&L). The program has defined the allocated baseline and is meeting all KPPs with some margin, as verified through analysis. Likewise, the program meets all MIL-STD-1521 (Technical Reviews and Audits for Systems, Equipment, and Computer Software) PDR criteria; however, the current program baseline for software development and integration lacks detail. DASD(SE) plans to conduct a Software Focused Review in FY 2014.
- **Risk Assessment** – The program is executing risk management planning in accordance with the program SEP. The program is working to mitigate risks in the areas of software definition, system architecture development, and program integration. The program has an active risk register with insightful technical risks identified.
- **Performance** – The program is on track to meet all six KPPs, associated KSAs, and TPMs documented in the EPS SEP. At the EPS System PDR, the program demonstrated this progress through analysis and modeling, showing margin against all requirements.
- **Schedule** – A December 2007 Acquisition Decision Memorandum directed the program to proceed to MS B. The program remains on track to meet the schedule thresholds documented in the draft Acquisition Program Baseline, and the program has held technical reviews on time. The program is on track for a MS B in March 2014.
- **Reliability** – The SEP establishes a plan for reliability growth, which is reflected in plans for software development and maintenance. The program is on track to meet reliability requirements. Reliability projections at the EPS System PDR project margins for each of the reliability requirements.
- **Software** – DASD(SE) participated in the EPS CAPS PDR. CAPS is the command and control portion of the overall EPS program and is currently sized at 915,000 equivalent source lines of code. The contractor, Northrop Grumman, showed the allocated baseline and demonstrated that requirements flow from the system to the segment and element. Forward and reverse traces show complete coverage. A Verification Cross-Reference Matrix and preliminary test plans document verification planning. Using model-driven engineering, the requirements are linked to the detailed architectural model. The contractor has an active risk and opportunity management program, and TPMs are defined, tracked, and reported monthly. The Systems Engineering Integrated Product Team is developing effective software reliability measures and has begun benchmarking the development system.
- **Manufacturing** – The EPS program relies on heritage AEHF payload hardware and software, a hosted satellite bus, and a combination of GOTS and COTS hardware for the terrestrial gateway and CAPS. The sole manufacturing effort for which the EPS program office is responsible is the CAPS software. The program has the beginnings of a Software Development Plan; however, the level of detail currently defined in the program baseline for software development and integration is very general. The program office took an action at the EPS System PDR to mature the software build plan.
- **Integration** – The EPS program has memoranda of agreement in place with all the external organizations with which it has interrelationships specified in the SEP, including the AEHF program, the payload host, and the Navy Multiband Terminal program. The program office is participating in all working groups necessary to maintain awareness of issues affecting EPS program GOTS items.

Conclusion: The program is on track. The program software build plan lacks the desired level of detail, but the program is taking action to mature this item.

Data as of 4th quarter FY 2013.

F-22A, Increment 3.2B Modernization (F-22A Inc 3.2B Mod)

Prime Contractor: Lockheed Martin Aeronautics

Executive Summary: The F-22A Inc 3.2B Mod is a hardware and software upgrade for the F-22A, the Air Force's advanced tactical fighter aircraft. Increment 3.2B is an ACAT ID program in the Engineering and Manufacturing Development phase. During FY 2013 DASD(SE) completed the Program Support Review (PSR) initiated in FY 2012 and participated in subsystem design interchange meetings, program technical reviews, and acquisition meetings to support the May 2013 MS B DAB.

Mission and System Description: The F-22A is a fifth-generation single-seat, twin-engine fighter designed for air dominance and survivable first-day and beyond air-to-ground capability. The F-22A incorporates advanced avionics and is low-observable, highly maneuverable, and capable of supersonic cruise. Increment 3.2B is a hardware and software modernization for air-to-air missile upgrades (AIM-120D, AIM-9X) and additional electronic protection, geo-location, data link, and stores management system improvements. Selected computer hardware and processors also will be replaced to improve throughput and margins.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2012. In response to PSR findings, the Program Management Office (PMO) revised the SEP in FY 2013 to include a software incremental development approach. The PMO updated the SEP again in August 2013 with a more robust staffing plan, as directed in the FY 2012 SEP approval memo. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC validated the F-22A Enhanced Global Strike Increment 3 CPD in April 2007. The baseline platform has 12 KPPs. Previous blocks (3.1 and 3.2A) addressed the three remaining KPPs. Therefore, Inc 3.2B has no specific KPPs but does address Inc 3 CPD KSAs: geo-location and AIM-9X/120D integration. In response to previous DASD(SE) concerns regarding the lack of 3.2B KPPs, the JROC rescinded the authority to trade the program's AIM-9X/120D integration KSAs. The Inc 3.2B requirements are stable and reasonable. The Air Force is planning future increments to address mandated safety, navigation, and security requirements.
- **Life Cycle Management** – There is a risk to the program's software sustainability because of the highly integrated and closed system architecture. The program is implementing mitigation steps as part of a future modular open systems architecture roadmap. The steps include a reassessment and procurement of data rights, and distributed processing.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in FY 2013 to support MS B.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in a subsystem Critical Design Review (CDR) for the Geolocation 2 capability, technical interchange meetings (TIM) for the radar subsystem CDR, a program technical review to track progress toward the System CDR in FY

2015, and the first of six planned Increment Capability Reviews (ICR) to assess prototype hardware and software drops to the lab. DASD(SE) did not conduct any formal technical review assessments in FY 2013, and none are planned in FY 2014. Since the program established a new Acquisition Program Baseline (APB) at MS B, DASD(SE) will provide quarterly Defense Acquisition Executive Summary assessments in the schedule, performance, management, interoperability, and production areas starting in FY 2014.

- **Risk Assessment** – The program's risk management process is documented in the SEP and in a separate F-22 Risk and Opportunity Management Plan. There is a schedule risk related to incorporating all external dependencies, including developing and integrating the AIM-9X operational flight software in time for operational test, concurrent sustainment software updates (4 and 5), and predecessor modernization capabilities (Inc 3.2A). There are technical risks in the areas of software integration, hardware, mission-data availability, and verification. All risks are assessed as manageable, and plans are in place for mitigation. The program has risk mitigation plans and an active monthly risk process to reduce probability of occurrence, but the program will need to closely manage and resource all mitigation plans to meet APB milestones.
- **Performance** – The Inc 3.2B program is on track to meet all the KSAs, other top-level attributes, and the Technical Performance Measures referenced in the SEP.
- **Schedule** – Inc 3.2B MS B occurred in May 2013. The MS C is planned in March 2016, but a 3-month delay in MS B to address cost-estimating shortfalls may result in a corresponding slip of subsequent milestones. The program continues to address PSR recommendations to improve the quality of the Government Integrated Master Schedule (IMS) with all external dependencies incorporated.
- **Reliability** – The program has an acceptable reliability and maintainability program consistent with USD(AT&L) policy. The design is projected to meet Inc 3.2B reliability requirements.
- **Software** – Inc 3.2B includes approximately 864,000 new airborne and ground equivalent source lines of code (ESLOC). The development incorporates 10 distinct, integrated hardware and software capability drops to the lab and/or flight test. The program plans to conduct six ICRs prior to the final System CDR to track technical progress. In response to DASD(SE) concerns about the program's ability to track progress-to-plan for an incremental development, the program has instituted "story-point maturity" and "work-velocity" metrics. After ICR-1 the software was slightly behind plan, but the contractor has a plan for recovery.
- **Manufacturing** – The program baseline is for 143 Inc 3.2B retrofit kits for Block 30/35 aircraft, plus nine kits for test aircraft. The program developed a business case before the MS B DAB to address delivery gaps between six prototype hardware-enabler components developed early in the program and the beginning of production. To avoid the potential of a 1-year delay of capability and additional diminishing manufacturing source risks, USD(AT&L) approved advanced procurement of the hardware to mitigate the delivery gaps.
- **Integration** – Increment 3.2B will be challenged to integrate and verify a large amount of software with updated processors, and the AIM-9X Block II and AIM-120D missiles. The PMO has partially addressed the lack of a detailed Government IMS, but the program will still be highly dependent on successful synchronization of incremental software builds with limited lab and verification resources. The PMO has established two memoranda of agreement with outside agencies to control weapons interfaces. To ensure a more event-driven development, the program will conduct integrated weapons launches in advance of MS C.

Conclusion: The program is working on known issues but will need to closely monitor execution of risk mitigation plans. The program is currently on track to achieve requirements.

Data as of 4th quarter FY 2013.

Global Positioning System (GPS) Enterprise

Prime Contractor: Multiple

Executive Summary: The GPS Enterprise consists of five MDAPs and pre-MDAPs in varying phases of acquisition and development. DASD(SE) conducted a Software Deep Dive in July-October 2012 to assess the progress of the program's software development effort in support of MS B, and co-chaired a Joint Program Status Review (PSR)/Independent Program Assessment (IPA) of the GPS Enterprise to support the FY 2013 Annual GPS Enterprise Review (AGER). DASD(SE) participated in the GPS III SV-09+ delta Preliminary Design Review (PDR) in April 2013, and the OCX Incremental Critical Design Review (iCDR) in June 2013 for software Increment (Inc) 1.5.

Mission and System Description: The mission of GPS is to acquire, deliver, and sustain reliable position, navigation, and timing (PNT) and nuclear detonation (NUDET) capabilities to U.S. Warfighters, our allies, and civil users. The GPS Enterprise has three segments—space, ground, and user—and comprises multiple MDAPs, each with significant scope and complexity.

- The space segment provides the GPS space vehicles (SV) (satellites) that make up the constellation. This segment includes four blocks: GPS IIR, GPS IIR-M, GPS IIF, and GPS III. The GPS IIF satellites are designed by Boeing, and the next generation GPS III satellites are designed by Lockheed Martin. Both are in the Production and Deployment phase. This segment also provides the NUDET capabilities.
- The ground segment provides the control system for the satellites and includes two programs: the current Operational Control System (OCS) (a component of the NAVSTAR GPS program) and the Next Generation Operational Control System (OCX). OCS is currently in the Operations and Support phase. OCX is in the Engineering and Manufacturing Development phase.
- The user segment consists of various receiver and processor systems that provide GPS PNT services to meet the needs of a broad user base in air, land, sea, and space. The Military GPS User Equipment (MGUE) program is in the Technology Development (TD) phase.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the GPS Enterprise SEP with associated OCX, MGUE, and GPS III Annexes in June 2012. The SEP documents the technical planning for the respective programs' systems engineering activities. The GPS Enterprise program is fulfilling the objectives of the SEP without waivers or deviations. The OCX program has reported on all required SEP metrics through the AGER process, monthly Program Management Reviews, and the iCDR events. The GPS III program has reported on all required SEP metrics through the AGER process and the SV-09+ delta PDR event. This reporting has afforded DASD(SE) insight into the GPS Enterprise program. The program is preparing an update to the Enterprise SEP, including a revised OCX Annex, and plans to submit the SEP for formal review in early FY 2014.

- **Requirements** – The JROC approved the GPS III CDD in July 2007. The CDD defines eight KPPs related to the space and control segments. The JROC approved the OCX CDD in 2009, reiterating these eight KPPs. These requirements are not allocated among the GPS component programs but are assessed in full against each individual program. The program KPPs and Technical Performance Measures (TPM) were assessed by OCX at the Inc 1.5 iCDR in June 2013, by the GPS III at the Joint PSR/IPA in February 2013, and at the SV-09+ delta PDR in April 2013. In all cases, the programs are on track to meet all requirements with margin. On September 25, 2006, the JROC issued "Joint Capabilities Document (JCD) for Positioning, Navigation and Timing (PNT), JROC Memorandum 187-06," which serves as the Initial Capabilities Document and defines MGUE initial capabilities. The program office is staffing a draft MGUE CDD that defines six KPPs for the various types of user equipment.
- **Life Cycle Management** – The GPS program has implemented affordability measures to reduce cost compared with the original program Independent Cost Estimate. The program has been proactive in evaluating additional excursions to consider budget profiles, procurement quantities, and cost savings for the next Follow-on Production Decision DAB. The program office identified long-lead parts for cost savings and incentivized procurement of parts for the NUDET mission to avoid obsolescence issues.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in December 2010. The program is updating the PPP to address recent policy changes and has conducted pilot criticality and vulnerability analyses.

Assessments
- **DASD(SE) Assessments**
  - DASD(SE) conducted a Software Deep Dive July-October 2012 to assess progress and quantify schedule risk for delivering the three OCX blocks. The assessment projected significant variation from the contractor schedule and some variation from the proposed Acquisition Program Baseline (APB) thresholds. The DASD(SE) schedule projection aligned with similar analyses by other external organizations, as well as with the OCX program Service Cost Position (SCP). At the MS B DAB, the Milestone Decision Authority (MDA) (USD(AT&L)) directed the Air Force to fund the program to the SCP estimate and to adjust the APB thresholds to the dates suggested by the DASD(SE) Deep Dive analysis.
  - DASD(SE) conducted a Joint PSR/IPA for the GPS Enterprise in February 2013 to support the FY 2013 AGER. The Joint PSR/IPA concluded that several life-extending initiatives on the GPS IIA, IIR, and IIF vehicles had extended life expectancy to the point that it reduces the risk that the constellation will drop below the specified 24 vehicles before the GPS III vehicles are ready for launch and OCX Block I is approved to operate. The Joint PSR/IPA observed that planning for MGUE is on track, but synchronization of the GPS M-Code capability is driven by fielding M-Code user equipment.
  - GPS III conducted a SV-09+ delta PDR to demonstrate readiness to migrate the satellites to the next increment of capability. The PDR successfully met all exit criteria.
  - DASD(SE) conducted quarterly Defense Acquisition Executive Summary assessments in October 2012, January 2013, April 2013, and July 2013.
  - A Joint PSR/IPA is anticipated in FY 2014 in support of the GPS AGER.
- **Risk Assessment** – The Enterprise and segments are executing their risk management programs in accordance with the approved SEP. The program office is working to mitigate risks to each component program, particularly in the area of Information Assurance vulnerabilities.
- **Performance** – The program is on track to meet all eight KPPs and associated KSAs and TPMs documented in the GPS Enterprise SEP, except the KSA for ground embedded time-to-first-fix.

Data as of 4th quarter FY 2013.

Trade-offs to reallocate this requirement from MGUE receiver unit to the host platform and, possibly, a modification in tactics, techniques, and procedures (TTP) are under joint review. The program KPPs and TPMs were assessed at the OCX Inc 1.5 iCDR in June 2013, at the GPS Joint PSR/IPA in February 2013, and at the SV09+ delta PDR in April 2013. The programs are on track to meet all requirements with margin. MGUE continues to demonstrate the ability to meet key performance criteria and producibility attributes in the TD phase.

- **Schedule –** GPS Enterprise is carrying risk for meeting APB schedule thresholds in both GPS III and OCX elements. OCX reached MS B in October 2012. Since MS B, OCX has eroded some schedule margin, but it remains on track to meet the revised schedule thresholds in the APB. The primary consequence of schedule risk is that sustainment of the GPS constellation in 2014-2018 is dependent on meeting the SV-01 "available for launch" threshold date of October 2015. Delays in development and production of the SV-01 mission data unit (MDU) put this date at risk. Additional factors include the IIR, IIR-M, and II-F space vehicle lifetimes, the availability of OCX Block 1 to conduct GPS III mission operations, and the availability of launch vehicles and range dates. The GPS Enterprise is executing several initiatives to extend the lifetime of the on-orbit IIR and IIR-M space vehicles, which has relieved some risk to the GPS III launch availability date.

- **Reliability** – All GPS Enterprise segments are meeting their reliability requirements and demonstrating reliability growth with significant margin. However, availability predictions for the GPS constellation show increasing risk in sustaining the constellation at present levels, due to aging on-orbit satellites. The program office currently predicts that the constellation will remain at or above the required 24 satellites until GPS III is available for launch, but a drop to this level will create a degradation of the service that users currently experience.

- **Software** – OCX is the most software-intensive segment of the GPS Enterprise. The OCX program will be delivered in two blocks. Block 1 is estimated at 943,000 equivalent source lines of code (ESLOC), and Block 2 at 177,000 ESLOC. The program manages and tracks software metrics, which have identified work being deferred to later iterations, ESLOC growth in each iteration, and software deficiency report generation/resolution rates. These metrics were contributors to the DASD(SE) Software Deep Dive analysis, which predicted a 12-18 month delay in the transition-to-operations of OCX Block 1.

- **Manufacturing** – The GPS III program has taken active steps to reduce manufacturing risk through the creation of the GPS III Non-Flight Satellite Testbed (GNST). The GNST is a pathfinder vehicle that will be used as a test resource to refine manufacturing processes in advance of the production of satellites 1-8. The program is pursuing an aggressive production and vehicle integration schedule, which is currently at risk because of manufacturing issues associated with radio-frequency interference in the satellite MDU.

- **Integration** – The program continues to face challenges in maintaining system integration discipline and minimizing schedule synchronization issues among its space, ground, and user segments. The 2013 Joint PSR/IPA recognized that across the GPS Enterprise, system integration process and tools have improved in the last year. Nonetheless, Enterprise-level processes can be strengthened and institutionalized, to maintain synchronization across GPS component programs.

Conclusion: The GPS Enterprise capability is currently on track. OCX and GPS III are experiencing development issues that may delay delivery of enhanced capabilities.

Data as of 4th quarter FY 2013.

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Joint Space Operations Center (JSpOC) Mission System (JMS)

Prime Contractor: N/A; the JMS System Program Office (SPO) is using the Navy's Space and Naval Warfare (SPAWAR) Systems Center as system integrator.

Executive Summary: JMS is a MAIS program that delivers a space command and control (C2) capability for the Commander, Joint Functional Component Command (JFCC) for Space, as well as space services to JFCC Space and other users. It provides a migration path from the legacy Space Defense Operations Center (SPADOC) system, for which 75 percent of components are beyond end of life or end of service and the majority of software is no longer vendor supported. JMS Increment 1 (Inc 1) achieved Initial Operational Capability in 2013, and Inc 2 is in the Engineering and Manufacturing Development phase. DASD(SE) participated in the Inc 2 Preliminary Design Review (PDR) in February 2013 and prepared a PDR assessment for USD(AT&L).

Mission and System Description: JMS will enhance and modernize space surveillance capabilities, create decision relevant views of the space environment, and enable efficient distribution of data across the space surveillance network. JMS will access intelligence on adversary space operations, process surveillance of all space objects and activities, maintain detailed reconnaissance of specific space assets, fuse space environmental data, maintain awareness of cooperative space assets, and allow JFCC Space to conduct space forces integrated command, control, communications, processing, analysis, dissemination, and archiving activities. Inc 1 consists of an operational and test suite of hardware and software located in the JSpOC at Vandenberg Air Force Base, California. Inc 1 provides a foundational net-centric service-oriented architecture (SOA), a user-defined operational picture capability, and an initial set of operator/analyst mission tools. Inc 2 will build on the Inc 1 technical baseline to deliver the large bulk of operator/analyst capabilities required to transition off the legacy JSpOC system.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP supporting Incs 1 and 2 in February 2013. The program is fulfilling the objectives of the SEP without waivers or deviations. The program's agile development approach facilitates integration between the systems engineering team and the development team. Technical issues are manageable.
- **Requirements** – The JROC validated the JMS CDD in July 2012. The Air Force is using an agile IT development process, in which a Requirements and Planning Council (R&PC) balances budget, schedule, and user priorities to allocate requirements to specific increments. The R&PC allocated all 5 KPPs, as well as 5 of 10 KSAs and 16 of 35 Other System Attributes (OSAs) to Increments 1 and 2 combined. Future increments will address remaining capabilities. The JMS systems engineering process integrates its agile development environment with a traditional top-down requirement-decomposition process to develop the allocated baseline. Requirements trace from the approved CDD to the Functional Requirements Document (FRD) and down to the Inc 2 Applications Requirements Document, with 1,104 requirements statements. This allocation has remained stable.

Data as of 4th quarter FY 2013.

- **Life Cycle Management** – The program has implemented affordability measures to reduce cost compared with the original 2010 program Independent Cost Estimate. These efforts include deferring select non-KPP requirements to future increments; maximizing use of existing Government-developed software and prototypes; maximizing use of mature, commercially available software under fixed price contracts; and leveraging Government integration expertise in lieu of a large integration contract. The June 2013 Acquisition Decision Memorandum assigned affordability caps for both acquisition and operations/support costs.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in May 2013. There are no issues and no current plans for an update.

Assessments
- **DASD(SE) Assessments** – DASD(SE) participated in the Inc 2 PDR in February 2013 and conducted an assessment of the PDR to include the preliminary design, associated risks, and open issues or action items. DASD(SE) assesses that the program has completed its preliminary design and demonstrated a high likelihood of accomplishing its intended mission.
- **Risk Assessment** – The program office is executing the risk management program documented in the Risk Management Plan and in the SEP. JMS is working to mitigate risks related to integrating commercial and Government software, as well as the ability to migrate data from higher security to lower security systems.
- **Performance** – JMS fielded Inc 1 in November 2012 and met two of the program's five KPPs. The program is on track to meet all remaining requirements allocated to Inc 1 and 2 by the R&PC, including all 5 KPPs, 5 of the 10 KSAs, and 16 of the 35 OSAs. Current projections for Technical Performance Measures, as documented in the SEP, are all positive.
- **Schedule** – JMS successfully passed both the Inc 1 MS C and Inc 2 MS B in 2013. The next Acquisition Program Baseline milestone is the Inc 2 MS C/Full Deployment Decision, on track for FY 2016. The Inc 2 Critical Design Review is on track for May 2014. The program conducts annual In-Process Reviews with the USD(AT&L).
- **Reliability** – The program has a comprehensive Reliability, Availability, and Maintainability (RAM) program. The preliminary Inc 2 design reflects the allocation of RAM requirements to the subsystem level. Analysis shows the current JMS architecture can meet reliability requirements. Mean time between critical failure (MTBCF) is the driving requirement, and the predicted operational availability is 99.95 percent. In order to provide sufficient test time to assess reliability growth, the program is integrating reliability testing into all Service Packs.
- **Software** – JMS Inc 2 software development and planning are on track. The program integrates software products already developed by Government or commercial providers by developing "glueware" to integrate these software products into JMS capabilities. The current estimate for Inc 2 glueware is 311,000 equivalent source lines of code.
- **Manufacturing** – JMS is a MAIS program and has no plans for production. The operational system is deployed to the JSpOC.
- **Integration** – JMS is a software-integration program that incorporates Government-developed software and commercial off-the-shelf software into its service-oriented architecture infrastructure. Through a gating process, the program screens candidate software before accepting it for integration as JMS products. The program has in place or is developing necessary agreements with external organizations. JMS is working closely with the Space Fence program office to refine and extend the JMS Enterprise Data Model (EDM) to ensure integration. The JMS Service Pack 11 will support testing with the Space Fence program.

Conclusion: The JMS program is on track to deliver required capabilities in an incremental manner.

Data as of 4th quarter FY 2013.

KC-46 Aerial Refueling Tanker (KC-46A)

Prime Contractor: The Boeing Company

Executive Summary: The KC-46A is a military version of the Boeing 767 commercial aircraft. The new aerial refueling tanker is an ACAT ID program in the Engineering, Manufacturing and Development (EMD) phase and successfully completed its Critical Design Review (CDR) in August 2013. In FY 2013, DASD(SE) actively participated in the CDR and conducted a CDR assessment.

Mission and System Description: The KC-46A's primary mission is to provide aerial refueling support to the Air Force, Navy, and Marine Corps as well as to allied nation coalition force aircraft. Secondary missions include emergency aerial refueling, airlift, communications gateway, aeromedical evacuation (AE), forward area refueling point, combat search and rescue, and treaty compliance.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in January 2012. The SEP will guide the technical planning and execution during the EMD phase. The program is fulfilling the objectives of the SEP without waivers or deviations and plans to update the SEP to support MS C.
- **Requirements** – The JROC approved the CDD for the KC-135 Replacement Aircraft in December 2006. The CDD addresses "air refueling" shortfalls and documents specific capabilities the KC-46 program must provide. The program requirements are reasonable and stable.
- **Life Cycle Management** – Program efforts to control overall weight are on track and will reduce fuel consumption costs during the Operations and Support phase of the program.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in December 2010. The program is developing an update to support the MS C decision in 4th quarter FY 2015. The program is reassessing its critical program information and completing a new vulnerability assessment.

Assessments
- **DASD(SE) Assessments** – DASD(SE) performed a CDR assessment in August 2013. The design is projected to meet or exceed all Air Force KPPs, KSAs, and system specification requirements. There are no program-level interoperability or integration issues at this time; however, integration of the Tactical Situational Awareness System (TSAS) warrants monitoring because of its complexity and its key contribution to meeting system capabilities.
  - DASD(SE) plans to perform quarterly Defense Acquisition Executive Summary assessments in the system performance, program schedule, management, production, interoperability, and information security areas in FY 2014.
- **Risk Assessment** – The program is executing a risk management program as defined in the SEP and Risk Management Plan. The Risk Management Board meets monthly and effectively

Data as of 4th quarter FY 2013.

allocates and prioritizes resources to address all risks. Key risks are software development and integration, the flight test execution, boom refueling system maturity, ownship empty weight (OEW) required to achieve fuel offload requirements, and the schedule to provide 18 aircraft at the Required Assets Available date.

- **Performance** – The program is projected to meet or exceed all nine KPPs and five KSAs. The program is on track to meet all requirements by FRP.
- **Schedule** – MS B was conducted in February 2011. The program successfully completed a CDR in August 2013, a month before its contractually required date. The next major event is first flight of the tanker-configured aircraft in 2nd quarter FY 2015. The program is on track for a MS C decision in August 2015.
- **Reliability** – The KC-46A is based on the 767 commercial aircraft, which has demonstrated high reliability. The program established a growth improvement program to track the reliability of select KC-46A components and subsystems to ensure each is achieving its respective reliability allocations. The program is on track to meet or exceed reliability requirements, including the 92 percent mission-capable-rate KSA. The program has an approved Reliability and Maintainability Program Plan.
- **Software** – The program's planned total source lines of code (SLOC) is 15.7 million, of which approximately 2.7 million SLOC will be new or modified code. This estimate represents a less than 6 percent increase in SLOC since the Preliminary Design Review in April 2012. Software estimates have been refined as the contractor has gained a better understanding of program requirements. The increase in SLOC is primarily due to the change in the TSAS design approach, which capitalizes on mature heritage software from other Boeing products such as the Airborne Warning and Control System (AWACS) and the Navy P-8 aircraft. The program has a software working group that meets quarterly.
- **Manufacturing** – Manufacturing planning is on track to produce KC-46A systems to support first flight and developmental testing. The program successfully transferred the boom assembly production center from Wichita, Kansas, to the Puget Sound Area in Washington. The program held the 767-2C Production Readiness Review in May 2013, and the Government program office approved the Manufacturing Program Plan in May 2013. The contractor achieved all 26 Manufacturing Integrated Master Plan CDR entrance criteria elements. The prime contractor began assembling the first refueling boom in October 2012 according to plan. The program is managing a production risk related to configuration changes to the LRIP aircraft that may be required due to flight test results. Production of the first three KC-46A aircraft are under way. The program remains on track to deliver 18 combat-ready tankers by 2017.
- **Integration** – The contractor performed a comprehensive Functional Thread Analysis to reduce the risk of finding large issues during integration testing and to validate supplier requirements, interfaces, and designs are correct. The thread analysis addressed KC-46A tanker missions; aerial refueling, airlift, and treaty compliance and was completed prior to the CDR. The contractor completes iterative software functionality builds followed by integration lab testing to reduce program integration risk. The verification process, plan, and artifacts are well defined and integrated with the certification, test, and thread analysis. The program has established multiple Integrated Product Teams to exchange information and manage integration activities.

**Conclusion:** The design and development of the KC-46A is proceeding as planned and is expected to meet required KPPs and KSAs. Program risks are well known, and the program is managing mitigations appropriately.

Data as of 4th quarter FY 2013.

Small Diameter Bomb, Increment II (SDB II)

Prime Contractor: Raytheon Missile Systems

Executive Summary: The SDB II is a 250-pound class glide weapon designed to attack moving and stationary targets in adverse weather conditions. The SDB II is an ACAT ID program in the Engineering Manufacturing and Development (EMD) phase. In FY 2013, DASD(SE) monitored developmental and integrated testing results for indications of system performance and began the MS C Program Support Review (PSR). The SDB II program is working toward MS C but is at risk of not meeting the schedule because of delays in all-up-round (AUR) qualification and time to correct developmental test deficiencies.
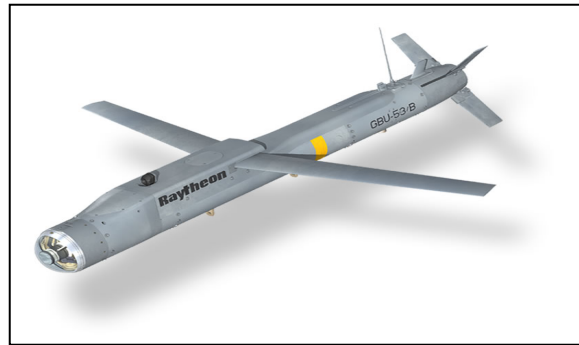
Mission and System Description: The SDB II weapon has three principal attack modes: normal, laser-illuminated, and coordinate attack. The weapon addresses the following Warfighter requirements: attack moving, stationary, and fixed targets, adverse weather operations, standoff range multiple kills per pass, multiple ordnance carriage, precision munitions capability, reduced munitions footprint, increased weapons effectiveness, minimized potential for collateral damage, and reduced susceptibility of munitions to countermeasures. The SDB II provides a network-enabled weapon capability via Link 16 and Ultra High Frequency Weapon Data Link.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the MS B SEP in May 2010. The program is fulfilling the objectives of the SEP without waivers or deviations. The program submitted a draft MS C SEP to DASD(SE) for review in September 2013.
- **Requirements** – The JROC validated the CDD in July 2009. For MS C, the program plans to staff the CDD in lieu of a CPD as the requirements are unchanged. The joint and Air Force requirements staffs concurred with this approach. The April 2013 PSR site visit confirmed the requirements are reasonable and stable. All KPPs and KSAs trace to the System Performance Specification and the Technical Data Package specifications and drawings.
- **Life Cycle Management** – The program will implement production initiatives related to cost reductions in the flight termination, telemetry, and tracking and control actuation systems. The program cost may also benefit from foreign military sales.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the MS B PPP in July 2010. The program is executing the processes in the approved PPP and is updating the PPP to support MS C.

Assessments

- **DASD(SE) Assessments**
  - DASD(SE) began the MS C PSR in April 2013, but completion is delayed until FY 2014 to allow time for the program to address system failures discovered in test. The PSR team observed the program's use of a fixed price incentive firm target contract, a 20-year warranty, open communication with stakeholders, a strong process for controlling design changes, and a production reliability incentive program. The program accepted the PSR team recommendations to formally address staffing a CDD in lieu of a CPD to resolve remaining

questions on F-35 and Joint Terminal Air Controller (JTAC) requirements; adjust the Integrated Master Schedule based on schedule health check comments; update the Technical Performance Measure (TPM) estimates; and acquire adequate software development metrics.

  o DASD(SE) completed quarterly Defense Acquisition Executive Summary assessments in the areas of schedule, performance, management, interoperability, and production.

- **Risk Assessment** – The program is executing to the January 2013 Risk Management Plan. As of the September 2013 Risk Management Board, the program is mitigating five performance risks related to F-35 integration (environmental and separation), target classification, target acquisition in weather, and simulation validation.

- **Performance** – The program was on track to meet all 5 KPPs and all 10 KSAs based on modeling and simulations, lab results, subsystem qualification testing, successful captive flight tests, and two of four successful free flights. However, after two free flight failures revealed anomalies, the program halted guided flight tests. The program implemented corrections and expects to complete verification of fixes in 1st quarter FY 2014.

- **Schedule** – The program manager slipped MS C by at least 6 months from the Acquisition Program Baseline schedule threshold of January 2014 to July 2014. MS C delays are a result of challenges in integrating parallel development activities, delays in qualification, and time to correct developmental test deficiencies, culminating in a System Verification Review schedule slip by the contractor.

- **Reliability** – SDB II reliability requirements and TPMs are included in the SEP. Based on quarterly metrics, the system reliability requirements will be met at weapon maturity. In August 2013, the SDB II team successfully completed 345 hours (versus 253 predicted hours), of test-analyze-and-fix reliability growth testing with analysis ongoing.

- **Software** – SDB II software includes approximately 633,000 source lines of code, which fall mainly across three computer software configuration items. Software is being developed iteratively over six builds. The PSR team provided a recommendation for the program to institute adequate software development metrics as the program has little insight into the contractor's development effort; this remains a shortfall.

- **Manufacturing** – Results of the May 2013 Manufacturing Readiness Assessment indicated all 68 production processes are mature. The contractor and its suppliers have established pilot production lines and demonstrated production processes using engineering assets. The contractor built four AUR test assets on the LRIP line using LRIP processes and personnel. The industrial base has sufficient capacity to support LRIP.

- **Integration**
  o The program is mitigating a risk related to the F-35 development delays, causing the SDB II to be designed to an unvalidated F-35 bay environment.
  o The program office is collaborating with the Air Force, Marines, and Special Operations JTAC Kit program offices to ensure the kits are enhanced for controlling the SDB II weapon.
  o The program uses a steering group to address SDB II and similar net-enabled weapon programs concerning integration with command-and-control systems of systems.
  o The program is executing to memoranda of agreement with the F-15E, F-35, and JTAC programs, as well as with the Mission Planning Division; these have been in place since at least 2007.
  o The program obtained or is on track to obtain certifications identified in the SEP relating to Information Assurance and Net-Ready.

Conclusion: The SDB II program is working toward MS C but is at risk of not meeting its schedule because of delays in system qualification and time to correct system failures discovered in test.

Data as of 4th quarter FY 2013.

Three-Dimensional Expeditionary Long-Range Radar (3DELRR)

3DELRR Conceptual Design
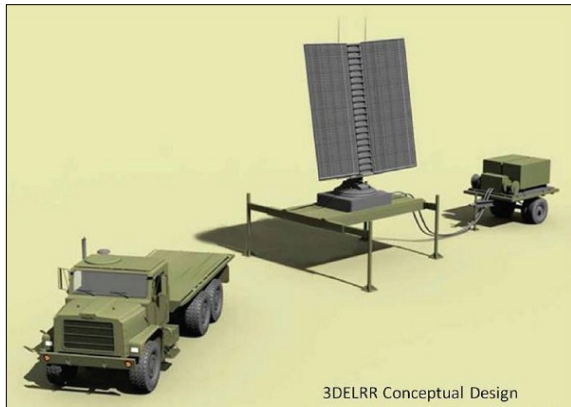
Prime Contractor: To be determined

Executive Summary: 3DELRR will be the principal Air Force long-range, ground-based sensor for detecting, identifying, tracking, and reporting aerial targets for the Joint Force Air Component Commander through the Theater Air Control System. It will replace the aging USAF AN/TPS-75 radar system, which is incapable of detecting some current and emerging threats and is becoming more difficult and costly to maintain. The 3DELRR acquisition is a Pre-MDAP (projected to be ACAT ID) approaching MS B. DASD(SE) participated in Preliminary Design Reviews (PDR) with the program office and each of the three competing technology development phase contractors and prepared a PDR assessment.

Mission and System Description: The 3DELRR will provide the Air Force Control and Reporting Center (CRC) operators with a precise, real-time air picture of sufficient quality to display air activity and conduct positive control of individual aircraft. The 3DELRR will be a transportable/deployable system consisting of a rotating antenna array assembly on a pedestal. Signal and data processing electronics are housed both in the rotating array assembly and in the pedestal. An additional shelter houses communications equipment and additional data-processing hardware and software. An identification, friend or foe system will be an integral part of the 3DELRR. The 3DELRR may be controlled locally by operator/maintainers, or remotely by operators at the CRC. The system may be powered by Government-furnished generators or grid power.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – The Program Executive Officer approved the SEP in March 2009 to support MS A. The program has submitted a draft SEP for the Pre-Engineering and Manufacturing Development (EMD) Review DAB and subsequent release of the EMD RFP. The program is fulfilling the objectives of the SEP without waivers or deviations.
- **Requirements** – The JROC approved a revised CDD in July 2013. The revised CDD requirements reflect the results of trade studies, prototyping, and the preliminary design process. The program revised the Technical Requirements Document (TRD) to conform with the revised CDD and will include the TRD with the EMD RFP. Contractors are expected to modify their design specifications, which were reviewed during the PDRs, to meet the revised TRD requirements. The program requirements are reasonable and stable, although some trades among lower-level requirements are ongoing. The requirements lead to a radar that will include a high-power and efficient transmit-and-receive capability with advanced digital beam forming to meet system requirements.
- **Life Cycle Management** – The program office and the Technology Development (TD) phase contractors have conducted requirements analyses by assessing the performance of varied radar architectures in five key areas against costs to identify the appropriate balance of performance and life cycle cost targets. The 3DELRR is a Defense Exportability Features (DEF) pilot

program. Contractors' PDRs included an assessment of how DEF may be included and the impact on cost and performance.

- **Program Protection Plan (PPP)** – The program submitted a draft PPP to DASD(SE) for the Pre-EMD Review DAB. The program plans to submit the Air Force–approved PPP for approval in FY 2014.

Assessments

- **DASD(SE) Assessments** – DASD(SE) participated in 3DELRR System Requirements and Functional Reviews and a system-level PDR with each of the three TD phase contractors. The PDRs were well conducted, and each contractor established an allocated baseline for their design. The results of these reviews along with the contractors' trade studies and prototyping results informed requirements changes in the CDD and TRD. DASD(SE) assessed each of the PDRs and concluded that the program's requirements are achievable, and the program demonstrates a high likelihood of accomplishing its intended mission.
- **Risk Assessment** – The program continues to manage risks as documented in the SEP and Risk Management Plan. Current risk areas include meeting reliability requirements and the reuse of software. The program revisited the rationale for their reliability requirements as informed by information obtained in the PDR process and revised the requirements accordingly. The program has added tasks and deliverables to the EMD RFP to reduce risks in these areas.
- **Performance** – Predicted performance presented at the PDRs, results from prototyping efforts, and Technical Performance Measures indicate that the program is on track to meet its six KPPs and seven KSAs.
- **Schedule** – The program is currently in the Technology Development phase, having passed MS A in May 2009. The program completed PDRs for each of three contractors in June 2013 as planned in the program's SEP. A Pre-EMD Review will be held in October 2013, and MS B is now planned for 3rd quarter FY 2014.
- **Reliability** – The updated reliability requirements have been incorporated in the approved CDD and TRD. The program system reliability requirements and the Reliability, Availability, Maintainability, and Cost Rationale (RAM-C) Report remain under review in preparation for the MS B DAB.
- **Software** – Each TD phase contractor provided a Software Development Plan and estimates for their development effort. The contractors prototyped and demonstrated critical software elements in the system prototype and/or offline.
- **Manufacturing** – The program management office assessed each contractor's manufacturing capabilities and plans in conjunction with the PDRs. Contractors have indicated that existing facilities and processes may be used for much of the manufacturing efforts. The manufacturing assessments indicate critical technology elements (e.g., gallium nitride (GaN)-based transmit receive modules) are mature and that planned manufacturing capabilities are mature for this point in the program.
- **Integration** – After their PDR, each contractor demonstrated internal system integration as part of the system prototype demonstration. The program management office has established working relationships with external organizations as needed and plans to establish memoranda of agreement for the EMD phase.

Conclusion: The program is on track to provide a radar system that will meet the user's operational requirements.

Data as of 4th quarter FY 2013.

4.4 DASD(SE) Assessments of DoD Programs

Assessments are as of 4th quarter FY 2013. This section includes summaries on the following three programs:

- F-35 Joint Strike Fighter Aircraft
- Joint Light Tactical Vehicle (JLTV)
- Key Management Infrastructure, Increment 2 (KMI Inc 2)

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F-35 Joint Strike Fighter Aircraft

Prime Contractor: Lockheed Martin Aeronautics

Executive Summary: The F-35 is a three-variant family of multi-role fighter aircraft. The program is in the System Development and Demonstration (SDD) phase and continuing LRIP simultaneously. DASD(SE) participated in subsystem technical reviews, risk review boards, and manufacturing reviews; assessed software delivery; and conducted an update to the November 2011 USD(AT&L)-directed Quick Look Review (QLR), to inform the Milestone Decision Authority regarding readiness for increased production rates in FY 2014.

Mission and System Description: The F-35 program plans to develop and field an affordable, common family of next-generation, multi-role strike aircraft for the U.S. Air Force, Navy, Marine Corps, and allies. The three variants are the Air Force Conventional Takeoff and Landing, the Navy Carrier Variant (CV), and the Marine Corps Short Takeoff and Vertical Landing (STOVL).

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in December 2009. An update in November 2010 included improvements in risk management. There are no approved waivers or deviations from the SEP. The program is meeting the objectives, but the SEP lacks a description of current technical processes, schedule, and organization. OSD will require the program to submit a SEP for approval at MS C.
- **Requirements** – The JROC validated the MS B Operational Requirements Document (ORD) in April 2000, and the Joint Program Office (JPO) incorporated the requirements in a Joint Strike Fighter Contract Specification (JCS). During a CY 2013 review, the program reaffirmed that the JCS contained all the ORD requirements. Program-level requirements are stable.
- **Life Cycle Management** – The program established a "cost-war room" in the JPO to reduce Operations and Support (O&S) costs and to identify potential should-cost savings.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in December 2010. DASD(SE) worked with the program to address supply-chain risks and vulnerabilities for an updated PPP in FY 2014.

Assessments

- **DASD(SE) Assessments –** DASD(SE) participated in several subsystem technical reviews including a Production Readiness Review (PRR) and a QLR update. The QLR update confirmed that the risk was lower for the helmet, arresting hook, integrated power pack, and lightning protection, but risk remains in other areas including buffet, mission systems software, sustainment software, and tail heating. DASD(SE) also updated software analyses with the support of the JPO and the contractor, and participated in acquisition/systems engineering planning activities.
- **Risk Assessment** – Program risks are known and understood. The program has risks in development, sustainment, and production. Risk mitigation plans are in place, but documentation lags. The program made risk burn-down progress in FY 2013.

Data as of 4th quarter FY 2013.

- **Performance** – The program is on track to meet seven of the eight KPPs. An issue with incorrect analysis/assumptions is hampering the attainment of the sortie generation rate (SGR) KPP. The program office is examining the sensitivity of the SGR KPP to establish more operationally realistic ground rules and assumptions. As a result, the program plans to reassess SGR. Although on track, the combat radius, STOVL performance, and CV recovery KPPs have limited margins. During a requirements review this year, the program determined of 62 non-KPP ORD thresholds, 16 are not achievable by the end of SDD based on the current plan, and eight others are at risk of not achieving the threshold. The program identified corrective actions or has way-ahead recommendations.

- **Schedule** – USD(AT&L) recertified MS B in February 2012 and approved an Acquisition Program Baseline (APB). A MS C/FRP decision is planned for 2nd quarter FY 2019. The program instituted a Block Review Board process to improve software integration with other activities and to support a more realistic SDD Integrated Master Schedule (IMS). The program maintains a technical review schedule, but many of the year's events were delayed because the program had not met the entrance criteria. DASD(SE) plans to conduct an IMS assessment in FY 2014.

- **Reliability** – Reliability data are below growth curves for all variants, and the program could face a risk to meeting reliability requirements without dedicated funding for a reliability growth program. Similarly, since O&S costs are based on meeting the required reliability at maturity, there are increasing risks to O&S cost and future aircraft availability. The program does not plan to complete prognostics portion of the Prognostics Health Management (PHM) requirements within SDD.

- **Software** – Software delivery for the remainder of Blocks 2/3 is a challenge because of the size and complexity (~28.9 million software lines of code (SLOC), with ~2 million SLOC remaining). DASD(SE) forecasts a schedule delay for Block 2 and a delay for Block 3. As a result, the program improved software processes but also shifted resources to Block 2 at the expense of Block 3. DASD(SE) plans to conduct a software development review in FY 2014.

- **Manufacturing** – There was steady manufacturing progress in FY 2013, but quality, scrap/rework/repair, on-time part delivery, supplier execution, and reduced funding for future affordability initiatives are issues that may have an impact on costs for LRIP ramp-rate increases and FRP. In addition, there are production risks including part-interchangeability variation and fix schedule, outer-mold-line control, and maturing international capabilities. DASD(SE) participated in two supplier reviews and the annual prime contractor PRR. There was improvement from the previous year, but there are risks remaining for all eight manufacturing areas assessed. Mitigation plans are in place or in development for all production issues, risks, and PRR findings.

- **Integration** – Interoperability and information assurance (IA) certifications and verification and lab capacities are watch items. IA certification is on the critical path because most interoperability and full joint certifications cannot be completed until Block 3 capability is delivered and verified. Verification and lab capacity may not support Block 2/3 demands, adding schedule pressure to capability deliveries. The program plans more efficient verification and is evaluating lab-capacity mitigation options. The program has established memoranda of agreement and Interface Control Working Groups with weapon program offices as documented in the SEP.

Conclusion: The F-35 program completed subsystem technical reviews to address outstanding program-level technical issues and risks. Delivery of Block 3 software is the most significant threat to completion of SDD on the planned schedule.

Data as of 4th quarter FY 2013.

Joint Light Tactical Vehicle (JLTV)

Prime Contractors: Oshkosh; Lockheed Martin; AM General (competition)

Executive Summary: JLTV is a light truck intended to increase protection, payload, and performance over the High Mobility Multipurpose Wheeled Vehicle. The program is in the Engineering and Manufacturing Development (EMD) phase. DASD(SE) completed a Critical Design Review (CDR) assessment during FY 2013. Through this assessment and multiple other support engagements, DASD(SE) assessed the program as likely to meet its eight KPPs and two of the four KSAs. The remaining two KSAs, Average Unit Manufacturing Cost (AUMC) and Ownership Cost, will be assessed after completion of the ongoing cost data analysis. The program has an established initial product baseline and stable requirements. Each contractor completed testing in August 2013 and delivered 22 prototypes for the start of Government performance and reliability verification in September 2013.

Mission and System Description: The JLTV is a Joint Service program. It consists of a family of vehicles with companion trailers, capable of performing multiple mission roles that will be designed to provide protected, sustained, networked mobility for personnel and payloads across the full range of military operations. The JLTV includes two variants based on a common automotive vehicle platform: a two-seat variant to satisfy the Combat Support Vehicle requirement and a four-seat variant to satisfy the Combat Tactical Vehicle requirement, and a common companion trailer. The two-seat CSV variant has one base vehicle platform, the Utility/Shelter Carrier. The four-seat variant has two base vehicle platforms, the Close Combat Weapons Carrier and the General Purpose vehicle.

Systems Engineering Activities

- **Systems Engineering Plan (SEP)** – DASD(SE) approved the JLTV MS B SEP in June 2012. The program continues to follow the approved SEP, with the exception of risk management. Risk consequence definitions were modified after MS B to non-standard risk definitions, which discern between primary and non-primary KPPs, to better manage resources during EMD. Adequate plans are in place to address technical and schedule risks. A SEP update is planned to support MS C.
- **Requirements** – The JROC approved the JLTV CDD in January 2012. The combat developers are drafting the CPD through a series of five predetermined event-based data reviews, called Knowledge Points (KP). Program stakeholders use the results of these KPs to refine the program's requirements for the production phase.
- **Life Cycle Management** – The program's Acquisition Strategy and requirements are structured to incentivize the three EMD phase contractors to continue to adjust their vehicle designs to stay within the targeted $255,000 AUMC (250k BY11$) and $399,000 average procurement unit cost. These Base Year (BY) 2012 targets support Acquisition Program Baseline (APB) objectives. The program office developed an Operations and Support cost model to establish a cost target of $29,100 (BY12) per year per vehicle.
- **Program Protection Plan (PPP)** – USD(AT&L) approved the PPP in August 2012. The program continues to follow the processes specified in the PPP. Updates to the PPP are planned to support MS C.

Assessments

- **DASD(SE) Assessments** – DASD(SE) completed a CDR assessment in April 2013 to ensure a reasonable expectation that each of the three contractors' designs would meet key performance, schedule, and cost parameters, and were ready to proceed into fabrication, demonstration, and test. This assessment followed each contractor's Design Understanding Review (DUR) between December 2012 and January 2013, and the program office's Capstone DUR in March 2013. A DUR is a CDR surrogate and serves to inform key Government leaders of the detailed designs of the three winning EMD contractors without the program office taking control of competing contractor product baselines. The CDR assessment identified contractors' inconsistently allocated weight of the Government-furnished equipment and contractor-furnished equipment integration kits across their designs to minimize the base vehicle's curb weight and AUMC. The program office has since established guidelines for the allocation of kits. The vehicle size and weight constraints challenge contractor designs to support the integration of future capabilities.

- **Risk Assessment** – The program deviated from the risk management process documented in the approved June 2012 SEP by changing the risk consequence definitions to non-standard definitions that result in a lower assessed risk. Adequate plans are in place to address technical and schedule risks. Based on the DUR and contractor testing, the program's primary risk driver is system weight, which the program closely manages.

- **Performance** – Based on the CDR assessment, the design is stable and the testing is on track to provide data needed to validate the eight KPPs and two of the four KSAs. A cost data analysis is under way to assess the program's progress toward meeting the other two KSAs, AUMC and Ownership Cost.

- **Schedule** – The program entered the EMD phase at MS B in August 2012 and is on track to meet its next APB schedule threshold, MS C in July 2015. The program started system-level requirements verification in September 2013.

- **Reliability** – The results of the DUR indicate that the CDD threshold requirement of 2,400 mean miles between operational mission failure is achievable. Data presented at each contractor's DUR indicates each will start at this threshold on its reliability growth curves.

- **Software** – Each of the contractors has approximately 325,000 lines of codes and demonstrated software maturity during 500 miles of shakedown testing on each of the 22 prototypes.

- **Manufacturing** – Each of the three EMD contractors completed vehicle assembly of 22 prototypes for Government testing in June. The program maintains awareness of each contractor's manufacturing and quality processes through a series of contract deliverables that will support a Manufacturing Readiness Assessment in FY 2014.

- **Integration** – Each contractor successfully demonstrated its System Integration Lab in April 2013, before the start of contractor testing. The program office monitors design changes in EMD to ensure proper integration of contractor-furnished equipment and Government-furnished equipment through a series of monthly contract deliverables. The program manages 17 external memoranda of agreement in accordance with the approved SEP.

Conclusion: Based on the CDR assessment, the program is on track to meet its next APB schedule threshold, MS C in July 2015, and is likely to meet all eight of its KPPs and two of four KSAs. A cost data analysis is under way to assess the program's progress toward meeting the other two KSAs, AUMC and Ownership Cost.

Data as of 4th quarter FY 2013.

Key Management Infrastructure, Increment 2 (KMI Inc 2)

Prime Contractor:
Spiral 1 - General Dynamics, C4 Systems
Spiral 2 - Leidos (formerly SAIC)

Executive Summary: KMI Inc 2 replaces the unsustainable legacy Electronic Key Management System (EKMS) and provides the foundation for future secure key and software provisioning capability to meet net-centric warfighting needs. During FY 2013, the KMI program received an FRP decision for Spiral 1 and began development on Spiral 2. The program experienced delays in Spiral 2 but has improved while transitioning to a new prime vendor and an Agile development methodology. In FY 2013, DASD(SE) conducted a Software Focused Review, providing analysis and recommendations to assist the program in regaining schedule.

Mission and System Description: KMI builds the foundation for the future secure key and software-provisioning capability to meet the requirements of net-centric warfighting. KMI provides enterprise-level ordering, distribution, and management services of cryptologic products to enable secure communications for DoD, coalition, and allied users. KMI establishes a secure presence for key provisioning. This capability enables the transition of customers from EKMS to KMI. KMI provides web-based key ordering for all key types, and in Spiral 2, it will provide over-the-network keying directly to KMI-aware end cryptographic units.

Systems Engineering Activities
- **Systems Engineering Plan (SEP)** – DASD(SE) approved the SEP in August 2011 to support MS C. No updates are required as the program is post MS C; however, the program updated its SEP in May 2013 to document process changes as the program transitioned from Spiral 1 to Spiral 2. The program is fulfilling the objectives of the SEP without waivers or deviations. The program has established an effective metrics process with technical performance measures to project and track progress.
- **Requirements** – The JROC approved the KMI CPD in February 2012. The requirements contained in the CPD are reasonable and have stabilized during Spiral 2. The National Security Agency functional manager is effective in adjudicating Service capability priorities and providing them to the program. KMI has documented the requirements decomposition results into its Common Development Environment (CDE). As the program completes software development tasks, it updates the task status in the CDE, which in turn updates progress on higher-level requirements.
- **Life Cycle Management** – KMI awarded the FRP contract for the client nodes in August 2013. Contract costs were in line with objectives and threshold values and represent an estimated savings of more than $15.8 million compared with LRIP costs, as a result of a competitive FRP.
- **Program Protection Plan (PPP)** – The DoD CIO approved the PPP in July 2013 following the Spiral 1 FRP decision. DASD(SE) supported the planning effort to address critical program protection and supply chain risks. KMI is executing the processes outlined in its PPP.

Data as of 4th quarter FY 2013.

Assessments

- **DASD(SE) Assessments**
  - DASD(SE) conducted a Software Focused Review in FY 2013 as a follow-up to a 2012 Critical Change Review. DASD(SE) briefed the results to the Milestone Decision Authority (MDA) and provided insights to other offices within OSD in June and September 2013.
    - DASD(SE) concluded that without immediate corrective action, individual lagging capabilities could lead to unacceptable development delays to the Advanced Extremely High Frequency and the Miscellaneous Common User Application Software efforts.
    - DASD(SE) recommended actions to increase the detail in intermediate planning activities and to better align resources. The program implemented the corrections, resulting in a manageable delay of approximately 2 months.
  - DASD(SE) assisted the program with reliability growth planning to focus attention on identifying token reliability issues, developing reliability corrective actions, and forecasting growth.
  - DASD(SE) plans to continue to routinely assess KMI's software development.
- **Risk Assessment** – KMI risk management processes are mature and documented in the SEP. The program is working to mitigate risks in the token reliability and tactical operations areas. KMI has focused attention to minimize further impacts from software development delays.
- **Performance** – KMI has achieved the Spiral 1 portion of its seven KPPs. The program experienced an issue with token reliability that prevented attainment of the Reliability KSA. As a result, the PM has implemented hardware and software modifications. Corrective actions will be evaluated in 2014. The program is on track to meet the Spiral 2 portion of its KPPs.
- **Schedule** – KMI includes two spiral developments. The program received an FRP decision in May 2013 for Spiral 1. Spiral 2 development delays may affect the program's Acquisition Program Baseline (APB) requirement to transition from EKMS to KMI by July 2014.
- **Reliability** – KMI is achieving its availability requirements for both the storefront and the client node; however, the KMI Token has demonstrated only 30 percent of its 10,000-hour requirement. DASD(SE) assisted KMI in developing and tracking the reliability growth plan. The KMI Token reliability continues to improve as failures are reduced by design enhancement, manufacturing improvement, and software corrections.
- **Software** – Spiral 2 is primarily a software development effort. KMI has transitioned to an Agile development method to provide early user feedback on the software. The program tracks Technical Performance Measures in near real time to assess progress and identify risks early. Although the program has experienced delays, the current progress is promising. The scope of the software development for Spiral 2 is estimated at more than 800,000 lines of code. Build schedules were informed by both contractor and DASD(SE) software parametric analysis. Software quality metrics indicate that defects are being found and corrected quickly.
- **Manufacturing** – The program manufactures two custom products, Advanced Key Processor and KMI Token, as part of the KMI Client Node, which includes other commercial-off-the-shelf components. The Client Node LRIP deliveries are ahead of schedule.
- **Integration** – Spiral 2 has demonstrated interoperability with the F-22 and Mobile User Objective System. The program plans to demonstrate interoperability with AEHF (Advanced Extremely High Frequency) in FY 2014. KMI has established effective procedures to transition accounts from EKMS within an acceptable timeframe.

Conclusion: KMI is on track to meet its requirements and APB provisions. The program achieved Spiral 1 FRP, and Spiral 2 development is proceeding almost on schedule. The program engages with OSD stakeholders to identify and solve problems as early as possible.

Data as of 4th quarter FY 2013.

APPENDIX A

Department of the Army
Systems Engineering Self-Assessment

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FY 13 Army Systems Engineering Self-Assessment

24 December 2013

Advancing the State of Systems Engineering for the Army

ASA(ALT) System of Systems Engineering and Integration (SoSE&I)

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1. System Engineering Overview

In Fiscal Year (FY) 2013, the Office of the Chief Systems Engineer (OCSE), merged with System of Systems Integration (SoSI) to become the System of Systems Engineering and Integration (SoSE&I) Directorate. SoSE&I, under the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)), provides coordinated System of Systems (SoS) analysis, engineering, architecture, and product integration to facilitate how the Army efficiently shapes, manages, validates, and synchronizes the fielding of integrated materiel capabilities. The Director, SoSE&I serves as the overarching management and oversight authority for SoS engineering policies and processes for the Army. SoSE&I is comprised of three main directorates: the System of Systems Integration Directorate (SoSI), the System of Systems Engineering Directorate (SoSE), and the Chief Information Officer (CIO).

FY13 Progress and Shortfalls

The Army identified three SE implementation improvement focus areas in FY13:

1. ***Development Planning (DP)***: The Army made progress in development of tools, trade-off methodology, and technology maturation. Work will continue to identify how tools and methodologies can be applied across the enterprise.
2. ***Army SE Bench***: In FY13 the Army laid the groundwork for significant gains in workforce development. The Army established a Systems Engineering Workforce Development Governance Board to act as the functional proponent for acquisition career field Engineering, to improve collaboration among Army organizations that oversee various aspects of the civilian workforce, and to expand distance learning opportunities. These efforts are seen as the start of aligning multiple workforce development initiatives that exist across the Army, and addressing shortfalls in personnel numbers and training.
3. ***Common SE Methodologies***: SoSE&I took steps to leverage existing Program Executive Office (PEO), Program Manager (PM), and Headquarters, Department of the Army (HQDA) G-8 knowledge environments to advance a common framework for SE tasks and for development, management, and analysis of requirements. Using the Army Systems Engineering Forum (ASEF), SoSE&I looked across the SE community, identified multiple areas for potential convergence, and requested the U.S. Army Materiel Command's (AMC) Research, Development, and Engineering Command (RDECOM) Systems Engineering (SE) Integrated Product Team (IPT) to examine those areas to identify commonality and efficiencies. Efforts to date represent good initial steps, but the Army will need to continue to address this area as a long-term effort.

The Army continued to make significant gains in Systems Engineering in FY13. However, overall progress was impacted by the fiscally constrained environment. In some cases resources

DESIGN • DEVELOP • DELIVER • DOMINATE
SOLDIERS AS THE DECISIVE EDGE

were diverted to maintain essential functions, limiting the ability to resource new initiatives. The Army was not able to fully realize all of its goals for FY13.

Other key areas of intended FY13 progress:

- ***Enterprise guidance and direction***: SoSE&I became significantly more involved in helping PEO/PM representatives in developing their Systems Engineering Plans (SEPs), and worked jointly with the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)) Major Program Support (MPS) Office to provide training. Due to resourcing constraints, SoSE&I was limited in its ability to attend PEO/PM design reviews and SE Working-group IPTs (WIPT). To mitigate, the Army leveraged virtual capabilities and utilized routine coordination and meetings with DASD(SE) MPS to share observations and identify issues for resolution.
- ***Reliability and Maintainability (R&M) Workforce assessment and training***: The assessment of the R&M workforce is being merged with the broader Army SE workforce development initiative, and most of the FY13 R&M workforce training was conducted under the 'full' Specialty Engineering, Education, and Training (SE2T) program. An assessment of the R&M workforce did not proceed as a separate initiative.

The Army has also identified three focus areas to improve in FY14:

1. ***System of Systems Engineering Management Plan (SoSEMP)***: SoSE will develop, implement, and maintain a SoSEMP to guide SoS acquisition planning, roadmaps, and decision making.
2. ***" 'Always On-On Demand (AO-OD)' Business Capability Lifecycle (BCL)" Acquisition Effort***: Implement the AO-OD BCL initiative to develop a realistic, representative, and relevant Operational Synthetic Environment for the research, development, test, evaluation, and experimentation of Network Modernization capabilities and gaps.
3. ***Systems Engineering Capability Optimization***: Identify required Army mission command capability adjustments and associated acquisition approaches, establishing a "good enough" mission command capability; the set of capabilities must be affordable, less complex, and set the conditions for future modernization efforts.

1.1 Service-level SE Strategy

The Army SE strategy aligns overarching objectives with the Army Campaign Plan (ACP) and the ASA(ALT) Strategic goals. As Army Commanders continue to lead and direct supporting staff toward a common purpose using mission orders, SoSE&I is using Reference Architectures (RAs) to inform programs how to nest formations within the Army and Joint/Coalition

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Interagency architecture construct. Seamlessly integrated and fully interoperable Army technologically advanced systems will allow the Army to maintain technological superiority over adversaries and improve Warfighting capabilities, as fully integrated and interoperable systems are a decisive combat multiplier. ASA(ALT) SoSE&I responsibilities under Army Regulation (AR) 70-1, as delegated by the Army Acquisition Executive (AAE), will continue to develop, implement, and maintain a set of guiding documents for Army SoS acquisition planning and synchronization of PEO/PM SE activities to ensure common execution across the Department of the Army (DA). SoS engineering executed at the HQDA staff level is distinguished from the SE activities executed at the PEO/PM level. This enables synchronization between SoS engineering and PEO/PM SE plans to ensure common execution across the Army. SoSE&I will provide the forums and processes to define and balance system performance, cost, schedule, and risk within a family-of-systems and SoS context, complementing SE activities that PEOs/PMs execute.

1.1.1 Objectives and Focus Areas

The objectives of the Army's SE efforts are to enable better acquisition outcomes and achieve the ASA(ALT) vision of a "highly efficient, effective, agile organization responsible for acquiring, developing, delivering, supporting and sustaining the most capable affordable systems and services for our Soldiers, which enables Soldiers to safely and securely dominate the operational environment and battlespace and achieve first look, first strike advantage with unprecedented speed and accuracy."

The complexity of the Army's modern systems makes a strong SE capability important to ensure the right systems are built and designed correctly, with minimal modifications. The Army Acquisition SE Community applies SE best practices, ensuring the best value for the Warfighter to support the ASA(ALT) strategic goals and ACP objectives and to equip the Army for the 21st Century, by emphasizing the following focus areas and objectives:

- **Early SE** and a disciplined acquisition approach that improves early understanding of requirements and technology, refines designs early, informs key decision points, and reduces uncertainty before commitment to a specific program path.
- Continue to establish a **Development Planning** capability to instill greater rigor and emphasize collaboration in new program initiatives, existing product improvements, and SoS combination and trade assessments. Development Planning facilitates a collaborative process to ensure the right programs are chosen and developed.
- Improve **visibility and traceability of requirements** across the SoS and develop an integrated requirements framework (IRF) to enable development, management, and traceability of requirements in one environment.
- Use appropriate tools and methodologies to **identify and manage risk early** and take the necessary steps to mitigate those risks.

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- **Identify cost drivers**, to include acquisition and life-cycle costs, to ensure cost estimates identify characteristics that will inform decisions based on evaluation of cost versus benefits.
- **Improve reliability** by emphasizing Reliability, Availability, Maintainability, and Sustainability (RAM&S) best practices and tools.
- Implement the **Common Operational Environment (COE),** which will unify software development across the Army and will be developed around a Common Foundation approach supported by common interfaces and standards implemented across six Computing Environments (CEs).
- Continue **Army Cloud Development** through the Army Cloud Working Group, focusing on advancing Information Technology (IT) efficiencies by establishing common standards.
- Mature the **Army Geospatial Enterprise (AGE)** that will enable the timely, accurate distribution of Geospatially-referenced Data and Information—including Geospatial Intelligence (GEOINT)—and result in reduced costs, improved interoperability, and better synchronization with the Joint, Interagency, Intergovernmental, and Multinational (JIIM) community.
- Utilize the **Value Engineering (VE) methodology** to improve value and reduce cost.
- Identify **Modeling & Simulation (M&S)** tools and applications to support program and Army leadership decisions across acquisition phases and to evaluate concepts, understand cost, reduce uncertainty, and predict performance.
- Develop **Reference Architecture (RA) products** that provide SoS engineering guidance for developing systems, concept, and formation architectural products across Army portfolios.
- **Improve** SE products by implementing a collaborative review process that ensures quality products are developed for use by the Acquisition Community.
- **Gain control of product and data rights** to facilitate competition throughout the acquisition lifecycle.
- **Improve configuration management (CM)** by standardizing processes and improving our program tracking tools.
- **Influence Science and Technology (S&T) efforts** to address technology gaps and maintain the Soldiers' first look and first strike advantages.
- Provide quality information to **support informed leadership decisions** on individual programs and across warfighting portfolios.

The Army Acquisition SE Community will develop and use the following fundamentals to meet outlined objectives:

- **Organization**: Define essential functions, refine organization structures, and document concept plans.
- **Workforce**: The Army Acquisition SE Community will strive to "build the bench," selecting and training personnel in hard engineering skills and appropriate soft skills.
- **Strategic guidance**: Develop necessary strategic guidance to communicate Army goals and provide direction to the SE workforce.
- **Community collaboration and sharing of best practices**. Identify common and systemic issues, formulate proposals, and socialize potential solutions through community forums and promote the use of identified best practices.
- Identify **common SE tools, methodologies, processes, and products** that promote efficiency across programs and architectures.
- **Information Management**: Build information sharing capabilities to ensure an informed workforce and make key information easily available and searchable.
- **Metrics**: Identify community-wide metrics to assess program progress, as well as measure progress across the acquisition enterprise.
- **Enforcement at the PEO Level**: Stress the importance of SE, track progress, and impose rigor and discipline into SE processes at the PEO level.

1.1.2 Systems Engineering Strategy Implementation

In order to implement the Army SE Strategy in FY13, SoSE&I focused on the following initiatives:

- Establishing the SoS General Officer Steering Council (GOSC) to shape/synchronize the development, production, and fielding of integrated materiel capabilities.
- Creating a SoS Engineering Management Plan (SoSEMP), which provides guidance on managing the development, design, delivery, and configuration management process.
- Delivering strategic-level, SoS engineering/architectural analysis for current/future force capabilities.
- Implementing the Capability Set (CS) Fielding construct to deliver fully-integrated suites of networked equipment.
- Developing a Common Operating Environment (COE) to converge the operating environment baselines.
- Utilizing Network Integration Exercises (NIEs) to integrate and mature the Army's tactical network.
- Employing the Agile Process to accelerate the pace of network modernization.
- Establishing engineering policy, guides, best practices templates, and metrics to ensure SoS discipline across the Army.

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- Improving Systems Engineering (SE) documentation review process to improve quality through strict adherence to Office of the Secretary of Defense (OSD) and Army policy and guidance.
- Conducting program reviews to ensure compliance with established policy guidance, architectures, and standards.
- Developing a model to cultivate the SoS engineering capability across the Army.
- Identifying science and technology (S&T) opportunities to enhance SoS capabilities.

1.1.3 Systems Engineering Contributions to Affordable Programs

The Army is establishing affordability constraints in the form of goals and caps for programs across the acquisition community. Affordability goals are being set at Materiel Development Decisions (MDD) to inform requirements and design tradeoffs. Affordability caps include unit procurement and sustainment costs. Annual Configuration Steering Boards look at the progress towards affordability for notification to the Army Acquisition Executive (AAE). In concert with the current fiscal climate PEOs also took steps in FY13 to contribute to cost effective programs without sacrificing SE integrity of systems fielded to the Soldier. PEOs/Program Managers (PMs) contributed by:

- PEO Combat Support and Combat Service Support (CS&CSS) Mobile Electric Power (MEP) Large Product Team used the Army Decision Making Process to identify the best location for future intelligent power distribution network microgrid controllers, avoiding duplication of development efforts and impacts to schedule.
- PEO CS&CSS Product Director Light Tactical Vehicles (PD LTV) utilized Independent Government Cost Estimates (IGCEs), inspection and manufacturing process controls, and an Integrated Master Schedule (IMS) to bring the M997A3 high mobility multi-purpose wheeled vehicle (HMMWV) Ambulance procurement project back on schedule and within budget after costs increased 50% and the schedule was delayed by 11 months.
- PEO CS&CSS Joint LTV (JLTV) developed Cost Informed Trades Analysis to identify applicable trades that lowered program cost by $250,000/unit.
- PEO Soldier Product Manager (PdM) Soldier Clothing and Individual Equipment (SCIE) conducted test efficiency exercises with the Army Test and Evaluation Command (ATEC) that identified $213k in cost savings and 10 weeks of schedule reduction.
- PEO Intelligence, Electronic Warfare and Sensors (IEW&S) is developing Sensor and Command Post (CP) CEs to implement a common set of solutions and core services across many programs to achieve interoperability, agility, and acquisition cost reductions. Common metrics can reduce hardware footprints and redundancy.
- PEO Simulation, Training and Instrumentation (STRI) implemented the Common Product Reuse policy, which leverages and reuses common products/components across the organization, to reduce development costs for new programs. In FY13, PEO STRI

updated the Common Standards, Products, Architectures and Repositories (CSPAR), which documents technical details for each identified reusable systems components, and is used to cement which products will be reused, and to what extent, on new programs.

- PEO STRI is also developing Live Training Standards to define the physical interfaces and data exchange details between training device components, allowing system component procurement flexibility and reducing sustainment numbers.

1.1.4 Lower Acquisition Category (ACAT)-level Oversight

Army PEOs and PMs oversee over 600 ACAT II and ACAT III programs. Most PEOs and PMs review ACAT II and III programs through Program Management Reviews, in accordance with Defense Acquisition University (DAU)/Program Management Office (PMO) Processes, as well as PM/Program directions at the working level. For example, PEO Ammo utilizes a consistent and common set of entrance and exit criteria that support management decisions, adopting criteria from DOD, and adhering to DAU guidelines during technical reviews. However, the timeframe and board in which reviews are conducted may vary.

PEO CS&CSS conducts quarterly metrics reviews and a bi-weekly Commander's Critical Information Requirements (CCIR) review to discuss progress and issues within the PMO. PEO IEW&S reviews the monthly IMS updates and conducts periodic reviews for all program categories. PEO Soldier employs the Integrated Product Team (IPT) construct, sometimes bi-weekly, to review and evaluate ACAT I and II SE program activities related to cost, schedule, and performance.

Documentation is also key to standardizing the oversight and management of ACAT I and II programs. PEO Aviation (AVN) system engineers contribute to the development of the H-60L Digital Black Hawk's, an ACAT II program, System Engineering Plan (SEP), Performance Work Statement (PWS), and System Specification, all of which support key decision points in the acquisition cycle. PEO Missiles and Space (M&S) develops SEPs for their three ACAT II and ten ACAT III programs, along with other documents, such as Acquisition Strategies.

1.2 Pre-Milestone A/B Rigorous Systems Analysis and Engineering

One of the major challenges the DOD acquisition community faces is how to effectively translate operational needs into the identification of the best materiel solutions. Historically, SE best practices have been employed mostly during the Engineering and Manufacturing Development (EMD) phase of the DOD Acquisition Model, more so than the Pre-Milestone A (Pre-MS A) and Technology Development (TD) phases. This is in spite of the well-established view that decisions made early in the system lifecycle have a largely positive effect on total lifecycle cost, effectiveness, and timeliness. The lack of a dedicated SE team during Pre-MS A hinders SE Subject Matter Experts (SMEs) from assisting in the efforts leading up to an MDD, to include

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considering the full range of feasible alternative solutions, developing concepts of operations, and making smart trades between system requirements, cost, and risk. Despite these identified limitations, the Army has committed to supporting SE activities during early acquisition phases by increasing the SE support and rigor applied to programs through Requirements Analysis, Test planning, Configuration Steering Boards, SoS engineering steering forums, and other efforts identified in Sections 1.2–1.7 of this self assessment.

1.2.1   Systems Engineering Plans (SEPs)

SoSE&I is participating in Pre-MS A activities by assisting PEO/PM representatives with developing program SEPs. SoSE&I, in conjunction with the Office of the Deputy Assistant Secretary of Defense Systems Engineering (DASD(SE)) Major Program Support (MPS) office, trains PEOs/PMs on ACAT I and II program SEP development. SoSE&I also reviews SEPs to ensure compliance with the OSD SEP outline, ASA(ALT)/Army Acquisition Executive (AAE) SEP policy, statutory and regulatory requirements, as well as verifying the SEP establishes a clear and consistent SE technical approach to meet program objectives.

During FY13, SoSE&I performed independent SEP reviews for multiple ACAT I and II programs including:

- Ground Combat Vehicle (GCV)
- Armored Multi-Purpose Vehicle (AMPV)
- Logistics Modernization Program (LMP)
- Indirect Fire Protection Capability (IFPC)
- Common Infrared Countermeasure (CIRCM)
- Paladin Integrated Management (PIM)

- Mine Resistant Ambush Protected (MRAP)
- Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhancement (MSE)
- Guided Multiple Launch Rocket System (GMLRS)
- Improved Turbine Engine Program (ITEP)
- H-60L Digital Black Hawk

1.2.2   Systems Architecting

The Systems Architecting competency has also been integral to providing Pre-MS A support, utilizing operational and systems architecture tools and techniques in the early phases of a Program of Record's (PoR) technology development efforts. Systems architectures are used to define the structure, behavior, and temporal aspects of the technology/system under development. The Army uses a dynamic system to integrate requirements data with system architecture modeling tools, allowing data to be directly traced to design decisions and ensuring all requirements are satisfied by the architecture design.

While this system is effective, the Army is in the initial stages of implementing the Model Based Systems Engineering (MBSE) methodology to develop SE and architecture artifacts with which Systems Architecting is accomplished. The MBSE provides an even greater structured

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mechanism to track and communicate key technical information in a purposeful way to inform the decision making process. It also allows for requirements data to be traced directly to design decisions and ensure all requirements are satisfied.

1.2.3   FY13 PEO/PM Efforts

PEOs/PMs, in addition to developing SEPs, are employing MBSE practices and collaborating with internal and external partners to introduce greater SE rigor in both Pre-MS A and Pre-MS B phases of the Acquisition lifecycle. In FY13, the Army established the Product Director Contingency Base Infrastructure (CBI) to design and maintain CBI SoS portfolios and Reference Architectures (RAs) using the MBSE approach. Through their MBSE pilot program, the PEO Missiles and Space (PEO M&S) IFPC Increment 2—Intercept (IFPC Inc 2-I) group produced system and sub-system specifications directly from the model to capture the test verification matrix metadata defined as a part of each specific system requirement. The IFPC Inc 2-I team also identified other MBSE modeling tool shortfalls, made necessary customizations to address those shortfalls, and incorporated lessons learned from the pilot program into "build-a-model" workshops, designed to educate new and existing SE workforce.

Through collaboration with internal and external acquisition partners, the PEOs/PMs have been able to expand the Army's involvement in Pre-MS A and B activities, extending SE best practices into all phases of the Acquisition lifecycle. During FY13, PEO CS&CSS Small and Medium Product Teams established a Memorandum of Agreement (MOA) with the United States Marine Corps (USMC) to jointly develop operational requirements for the Mobile Electric Hybrid Power Sources (MEHPS) program and capture them in a Capability Development Document (CDD). The collaboration on the CDD, as well as requirements traceability and prototype/commercial systems technical demonstrations has set a basis for assessing technical maturity. PEO Soldier collaborated with Army Communications-Electronic Research, Development, and Engineering Center (CERDEC) to assess and identify Research and Development (R&D) areas and improve component-level technology to support the Analysis of Alternative (AoA) recommended material solution.

The PEO M&S staff collaborated with the AMC-RDECOM Aviation and Missile Research Development and Engineering Center (AMRDEC) to develop the Integrated Air and Missile Defense Simulation (IAMDSIM), which merges high fidelity Program of Record (PoR) simulations, many of which contain tactical software. The IAMDSIM is built on the IAMD Simulation Framework (ISF), an AMRDEC FY13 research funded development, and may be used to generate performance data or integrated with extant hardware in-the-loop venues to support a variety of missile, radar, and command and control (C2) real-time venue applications.

1.2.4 FY14 PEO/PM Efforts

Supporting Pre-MS A and B activities and will only increase, as PEOs/PMs plan to continue creating, implementing, or improving the following program areas in FY14:

- PEO Soldier Product Manager for Soldier Clothing and Individual Equipment (PdM SCIE), Personnel Parachute Navigation System (PARANAVSYS) will evaluate commercial/government hardware/software (HW/SW) proposals against user requirements to ensure products meet the user thresholds and Capability Production Document (CPD) objectives.
- PEO Command, Control, and Communications-Tactical (C3T) will evolve the design of, develop policy for, and implement a Tiered SE Structure to further integrate systems into the SoS capability.
- Product Director Fire Support Command and Control (FSC2) will continue collaboration with Johns Hopkins University to evaluate Army Field Artillery Tactical Data System (AFATDS) Increment 2 alternatives and modify the original acquisition strategy.
- Product Manager Contingency Base Infrastructure (CBI) will expand MBSE capabilities to include additional analysis tools and enhance architecture development toolset to incorporate elements to meet DOD Architecture Framework (DODAF) 2.0 requirements.
- PEO Missiles & Space (M&S) will develop and implement a Risk Management Plan (RMP) policy for each acquisition program, regardless of ACAT designation.
- PEO M&S will continue SW improvement through the development of the COE Real Time Safety Critical Embedded (RTSCE) software architecture.
- Joint Program Executive Office for Chemical and Biological Defense (JPEO CBD) will use the Measurement and Analysis (M&A) processes to provide objective data on the actual progress of the Joint Program Manager (JPM) Information Systems (IS) integration management efforts for Joint Warning and Reporting Network (JWARN) Increment 2 to support the team's ability to understand and communicate project and product statuses.

1.3 Reliability, Availability, Maintainability, and Sustainability (RAM&S) Influence in Design & Development

In 2013, the Army Acquisition, Testing, and Requirements community developed a series of recommendations, currently in review with the Army Leadership, to improve efficiencies supporting test and evaluation (T&E). The Army identified that during the development of an acquisition program's Test and Evaluation (T&E) Master Plan, the resulting test program tends to be primarily schedule driven. This has lead to numerous programs entering official testing without demonstrating adequate system performance, most notably in the area of reliability. Failure to meet performance requirements during record testing usually results in increased

program development cost and T&E costs due to repeated testing, delayed acquisition schedules, and frequently results in program terminations. The Army has recommended that each Test integrated product team (IPT) should establish performance metrics that must be demonstrated prior to permitting the program to enter the next phase of testing; making the program's test strategy performance driven as opposed to schedule driven. During these Test strategy product team reviews, requirements can be considered for adjustment through a Configuration Management Board (CMB) if determined necessary. The Army is committed to ensuring RAM&S is an integral part of design and development through leading forums, or participating in external groups, revolving around RAM&S. Specific FY13 activities within designated groups, PEOs/PMs; Research, Development, and Engineering Centers (RDECs); and external agencies are discussed below. Some activities that were planned for this year were revised as previously identified approaches proved unsuccessful or were delayed due to budget constraints, sequestration cuts, and personnel furloughs.

1.3.1 Reliability & Maintainability Working Group (RMWG)

The Army continues to operate a RMWG, formerly the Reliability Improvement Working Group (RIWG), with senior level personnel participants from across the Acquisition community. The RMWG performs detailed assessment of RAM&S efforts throughout the acquisition lifecycle for Army Major Automated Information Systems (MAIS)/ Major Defense Acquisition Programs (MDAPs), collects lessons learned, identifies systemic root causes of reliability issues, coordinates support for the necessary gaps, and recommends solutions to leadership. During FY13 the RMWG assessed several MAIS/ MDAPs including: the Distributed Common Ground System–Army (DCGS-A), the Excalibur, the Ground Combat Vehicle (GCV), the Gray Eagle, and the Armored Multi-Purpose Vehicle (AMPV).

1.3.2 Reliability Systemic Working Group (RSWG)

In FY13, the Army established a RSWG to support the Test & Evaluation (T&E) Efficiencies Task Force. The group's initiatives include: identifying Operational Mode Summary/Mission Profile (OMS/MP) and M&S efficiencies, developing reliability requirements documentation procedures, standardizing the Improve Reliability Post-MS C process, developing improved Reliability Assessments, enforcing current Army Reliability Policy, developing Reliability Contract Language, ensuring Configuration Steering Board (CSB) Validation of RAM&S and Trades, adapting the Evaluation Risk Framework, and combining test efforts Reliability, Verification, and Improved Reliability Duty Cycle.

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1.3.3 Energizing RAM&S Community

1.3.3.1 Other Venues to Influence RAM&S

The Army participates in the DASD(SE) Service Lead Working Group (SLWG), which meets on a quarterly basis to update reliability content within DOD 5000.02 and the Defense Acquisition Guidebook (DAG), as well as capture reliability growth data within the Defense Acquisition Executive Summary (DAES) process.

Army stakeholders continue to participate in the Army Reliability and Maintainability (R&M) Managers forum, which meets monthly to identify lessons learned and best practices, improve intra-organization communication, facilitate collaboration, identify R&M resources, and discuss the implications of Army and OSD R&M regulations to programs.

1.3.3.2 Army Regulation (AR) 702-3, Army Materiel Systems RAM&S Regulation

The Army is committed to enhancing RAM&S in the acquisition process by implementing and revising policy, to include the AR 702-3, which incorporates R&M design, reliability planning methods, and key decision support reporting requirements to support early Engineering and Manufacturing Development (EMD) reliability test thresholds, engineering-based reliability program reviews, and operational requirements development. The development and completion of this regulation has been delayed almost a year, partly due to personnel and budget constraints, impacting the Army's ability to communicate to the Acquisition Workforce key RAM&S strategies outlined by both OSD and Army. AR 702-3 is in its final draft and final publication is planned for Calendar Year (CY) 2014.

1.3.3.3 Center for Reliability Growth (CRG) Activities

Several Army R&M organizations are recognized within the technical community for their expertise. For instance, AMC's Army Materiel Systems Analysis Activity (AMSAA), partnered with the Army Evaluation Center (AEC) under the CRG, continues to be recognized as the leader in reliability growth modeling. The CRG strives to improve reliability by providing policy, guidance, standards, methods, tools, and training. Specifically in FY13, the CRG:

- Emphasized the importance of applying condition-based maintenance data from actual fielded systems to enhance current systems' Operational Mode Summary/Mission Profile (OMS/MP) values.
- Promoted cost and risk assessment tools for use in AoA.
- With the Center for Army Acquisition and Materiel Lessons Learned (CAAMLL), included reliability lessons learned in the Reliability Focus Area.

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- Used Design for Reliability (DfR) tools, such as Modeling & Simulation (M&S), to influence early design decisions, optimizing the reliability of the system without a significant increase to design costs.
- Refined the SW-specific reliability scorecard so engineers can identify weak performers and risk early in program development.
- Continued to develop advanced reliability methodologies, e.g., Bayesian-based reliability growth modeling.
- Distributed over 600 reliability models across DOD and major defense contractors.
- Developed reliability contract language for hardware and software intensive programs.
- Identified an annual potential savings of $103M per year for Post Production Software support.

1.3.3.4 AMC-RDECOM Armament Research, Development, & Engineering Center (ARDEC)

The ARDEC contributed to RAM&S by:

- Developing internal Standard Operating Procedures (SOPs) to define the process and responsibilities for producing products and completing reliability activities within ARDEC.
- Using knowledge environment tools, such as the ARDEC Process Asset Library, to assist RAM&S engineers in planning, developing, and managing the right RAM&S program for Army systems throughout their lifecycle.
- Continued to develop the Ground System Advanced Reliability Capability (GSARC).

1.3.3.5 "Investment for Reliability" (I4R)

The Army Materiel Command (AMC) is continuing to explore a concept called I4R, which, if funded, could provide seed money to implement total ownership cost reductions and reliability improvement initiatives. The majority of savings would relieve current budgetary constraints, with a portion used for reinvesting in the program. A data call nominated almost 60 projects from organizations in the Army's Acquisition and Materiel Enterprises for an I4R project portfolio. AMC conducted the initial project prioritization and is currently refining the project selection criteria to factor in the source of investment funds and the type of funds that would benefit from savings and cost avoidance. Additionally, AMC is now also considering the overarching equipment reliability rating for the parent weapon system associated with the proposed project. This new review, coupled with the initial prioritization review that considered risk, reliability improvement, and return on investment, will ensure that I4R will focus on opportunities with the maximum benefit to the Soldier.

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1.3.3.6 Requirements Generation & Operational Mode Summary/Mission Profile (OMS/MP)

The Training and Doctrine Command's (TRADOC) Army Capabilities Integration Center (ARCIC) coordinates the development of formation level OMS/MPs with the materiel development and testing communities to ensure the generation of operationally-based RAM&S requirements are conducted early and as an on-going collaborative process. ASA(ALT) and ATEC participate during the requirements development process for common understanding, feedback, and accountability.

1.3.4 FY13 PEO Efforts

The Army PEOs/PMs have focused on integrating RAM&S principles into major development/acquisition programs through reliable testing metrics, insisting on RAM&S early in the development cycles, and updating reliability processes and procedures. The inclusion of RAM&S in these programs has allowed the Army to update, upgrade, and fix fielded systems.

In FY13, PEOs/PMs used the developmental test philosophy of test-fix-test to improve system RAM&S characteristics. Once failures are identified PEOs/PMs use SE best practices to capture and fix problems and inefficiencies during the sustainment phase. For example, the JPEO CBD Joint Project Manager for Nuclear, Biological, and Chemical Contamination Avoidance identified areas where RAM&S requirements were not met by performing early testing in the EMD Phase, which allowed the organization to correct the oversight early so RAM&S was effective during later phases. Within PEO CS&CSS, the Mobile Electric Power (MEP) group accelerated reliability analysis in an operational environment through their participation in Network Integration Exercises (NIEs). The high operational tempo of power generation at NIE and in theater highlighted issues that would not have surfaced for years in a peacetime environment. Fixes to these problems were rapidly developed and installed for verification prior to incorporation into the production line.

The PEO Ammo Excalibur Reliability Working Group conducted cycles of Highly Accelerated Life Testing (HALT) for Excalibur 1b, using a system reliability model that accounts for the expected operational life of the Excalibur projectile. The data used to predict storage and operational reliability was input data obtained from actual Excalibur tests. The analysis predicts the lifecycle of the projectile will include 18 years in controlled storage and 2 years in uncontrolled storage, to include transportation.

In fact, to ensure early incorporation of RAM&S requirements, many PEOs/PMs specify RAM&S requirements as an integral part of contract deliverables. Product Manager Air Warrior (AW) allocated reliability requirements to each contractor by writing them into their respective performance specifications. This ensures all vendors are contractually obligated to deliver a

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Reliability Production Report, as well as a Failure Modes Effects and Criticality Analysis and that all components of Air Soldier meet the CDD attributes for reliability.

In FY13, PEOs/PMs updated processes and procedures to support RAM&S in their programs. PEO IEW&S established a risk-focused SW Quality Assurance Policy. PM DCGS-A implemented the SW Quality Assurance Process and implemented an incremental SW development release to provide lower-level visibility, which will help personnel monitor SW maturity and reliability. The JPEO CBD Joint Project Manager for Radiological and Nuclear Defense linked RAM&S processes to the Joint Capabilities Integration and Development Systems (JCIDS) supporting processes to improve performance specification requirements and assist with planning and budgeting for T&E activities. In FY13, the PEO AVN (PM Fixed Wing (FW)) instituted a RAM&S data collection and analysis effort for the C-12 aircraft. When data is collected, PM FW will provide trend analysis to PMs and the Logistics Teams for the reliability improvement program.

Integrating RAM&S principles into key development/acquisition programs has allowed PEOs/PMs to upgrade, update, and/or fix systems to ensure durability, longevity, and availability.

- PdM Light Tactical Vehicles (LTV) implemented Automotive Improvement Program (AIP) component upgrades to the M1151 HMMWV line, adding electrical power availability, improving run-flat capability, and providing improved air conditioning (A/C) efficiency and reliability.
- Product Director (PD) Test, Measurement, and Diagnostic Equipment (TMDE) replaced cables with wireless capability on the Internal Combustion Engine Test Adapter Kit.
- PEO Ground Combat System (GCS) fielded the Stryker Double V-Hull with an upgraded system capable of operating at weights up to 55,000 pounds, significantly decreasing suspension component failures.
- PEO Soldier Product Manager Soldier Protective Equipment (PdM SPE) issued the Family of Concealable Body Armor (FoCBA) with two additional outer carriers, extending the service life of each system and improving system durability.

1.3.5   FY14 Efforts

The Army plans to improve RAM&S across the acquisition community in FY14 by doing the following:

- Maintain and lead the RMWG and participate in other RAM&S groups and forums.
- Engage with each Army MDAP to conduct a peer review assessment of their R&M program.

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- Track and enforce DOD, Army, and ASA(ALT) reliability policy through an extensive review of MDAP SEPs and associated supporting documentation, such as T&E Master Plans (TEMPs) and Reliability, Availability, and Maintainability-Cost (RAM-C).

Highlights of PEO/PM plans are:

- PEO AVN will initiate an extended RAM&S collection as part of the fielding process after Limited User Test (LUT).
- PEO AVN will establish a Detailed Statement of Work (DSOW) template to ensure each new project acquires the supporting lifecycle documentation to improve RAM&S efforts.
- PEO C3T will perform additional test and evaluation on the Joint Tactical Network (JTN) waveform code within the Information Repository through the implementation of the Data Accession List (DAL).
- PEO IEW&S/ PM DCGS-A will use software metrics to keep track and manage software defects during the test and evaluation (T&E) phase of DCGS-A software.
- PEO Soldier PM Soldier, Sensors and Lasers (SSL) is establishing field reliability metrics to assess reliability performance of fielded systems.

1.4   Systems Engineering (SE) During JCIDS & Contract Requirements

1.4.1   SE Contribution to JCIDS

SE during Pre-Milestone 'A' and JCIDS development has, in many cases, not been fully practiced due to the challenges in establishing program resources early in program development. Early system development efforts are primarily led by the Combat Development team supported by experimentation and analysis performed by functional proponent battle laboratories. SE professionals from across the PEO and PM communities participate in these activities as resources permit, to help ensure proper attention is paid to current and future interfaces, architectural and technical standards, and to ensure system testing and verification practices are considered and understood.

The Army is examining means to improve its ability to identify stressing requirements and critical trades, and help examine the full range of technical solutions. SoSE&I has advocated for a group of dedicated SE professionals, with developmental planning (DP) experience, supported by science and technology (S&T) researchers and portfolio management personnel, who will team to provide acquisition and SE expertise to assist the operational analyst in the development of critical documentation required for program initiation. Efforts to apply SE best practices across the enterprise are expected to improve the Army's effectiveness and efficiency in providing analytic rigor for informed requirements trades.

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In support of requirements development for System of Systems, SoSE&I established the Army Integrated Requirements Framework (IRF) process to provide a proof of concept to conduct analysis, provide findings regarding the commonality of requirements across requirements documents, and describe a proposed Agile Requirements Management Process to enable execution of SoS requirements.   SoSE&I IRF efforts are defining the standards at the SoS level for requirements data and configuration management. SoSE&I will align policies and directives to guide PEO and PM's down the right path, changing the way the Army is analyzing and defining requirements to better align the PM's system requirements to the JCIDS documented requirements. The resulting analysis will be captured in the Army IRF environment to allow for easy crosswalk with the Combat Developers to update and compare against existing documented requirements; this analysis will inform the Army of the materiel gap and determine if the PMs are interpreting the requirements correctly.

In FY13, additional recommendations for improved overall material acquisitions include items such as closer coordination between these communities during the JCIDS development process. The Army Capabilities Integration Center (ARCIC), in collaboration with the test and materiel developmental communities, reviewed the Army's Requirements Generation Processes to identify efficiencies in providing timely, concept-based, operationally relevant, achievable, affordable, flexible, and testable requirements capability documents while improving performance and reducing cost and schedule. Army leadership will consider implementing requirements development policy updates to promote efficiencies in providing timely, concept based, operationally relevant, achievable, affordable, flexible, and testable requirements/capability documents.

1.4.2   SE in Contract Requirements

SE requirements, including RAM&S, are incorporated into development contracts with industry early in the lifecycle of the program. PM Army Training Center (ATC), for example, utilized government-industry partnerships to shape contracting requirements that incorporated forward leaning provisions such as Test Driven Development automated testing, and state-of-the-art SW source code analysis to detect defects before they enter the baseline. This approach yields more opportunities for minor course corrections early, thus increasing the likelihood of success.

- PM Cargo Helicopters incorporates SE requirements into all Cargo contract requirement packages (CRPs). For example, the CH-47F Performance Specification is the foundation for all development efforts, establishing aircraft level performance requirements. Additionally, each development effort is required to follow a structured SE process, flowing down performance requirements into lower level detail requirements.

- Warfighter Information Network-Tactical (WIN-T) requirements were placed in the user requirements documents which flow into the Baseline Requirements Document, and then into each configuration item performance specification.

The following are examples where organizations incorporated SE requirements into contract vehicles with industry partners:

- **PdM Force Sustainment Systems (FSS)**: Joint precision Airdrop System and the Advanced Low-Velocity Airdrop System. Requirements included establishing a RAM&S program and conducting continuous risk management and technical review.
- **PM Petroleum and Water Systems (PAWS)**: Modular Fuel System and the Water Tank, Load Handling System (HIPPO).

Likewise, the following are examples where organizations incorporated RAM&S requirements into contract vehicles with industry partners:

- **Product Manager Light Tactical Vehicles (PdM LTV)**: High Mobility Multipurpose Wheeled Vehicle (HMMWV) Ambulance Program - requirements were placed in the Purchase Descriptions to make RAM&S requirements enforceable.
- **PM Sets Kits Outfits and Tools (SKOT)**: All PM SKOT contracts require commercial warranties on tools that include Life Time warranties.
- **Joint Light Tactical Vehicle**: Multiple RAM&S requirements in the CDD and traced into product development requirements listed as key system attributes (KSAs) and KPPs.
- **PdM Medium Tactical Vehicle (MTV)**: RAM&S requirements in its production contract.
- **PdM Heavy Tactical Vehicles (HTV)**: RAM&S requirements in its M870A4 production contracts.
- **Project Manager Soldier Sensors and Lasers (PM SSL)**: includes reliability growth programs in the statement of work.

1.5   FY13 Focus Area Progress & Improvements

1.5.1   Development Planning (DP)

The SE best practices developed to support Pre-MS A efforts also serve as good Development Planning (DP) practices. SoSE&I and the PEOs/PMs implemented a number of activities and tools in early SE phases that advanced the Army's capabilities.

1.5.1.1 Development Planning Working Group (DPWG)

The Army actively participates in the DPWG, an OSD forum. In FY13, the DPWG examined the interaction between DP and S&T, as well as SE activities required to support affordability, feasibility, and trades. The Army intends to use the results of this work to advance the state of its DP capabilities.

1.5.1.2 Tool Development

A number of different tools have been developed to facility DP:

- **Whole System Trade Analysis (WSTA)**: Developed by PEO GCS, it is a decision support framework that integrates subsystem models into a holistic systems view and identifies critical design choices and their consequences. This tool can be used to sort through large collections of available technology options, optimize trades on individual systems, and help find the compromise among competing objectives.
- **Capability Portfolio Analysis Tool (CPAT)**: Developed by PEO GCS, it performs analysis and identifies trade space to support strategic portfolio management. The CPAT Model provides a quantitative basis to discuss options for building a fleet, and identifies the impacts and costs each COA.
- **Advanced Systems Engineering Capability (ASEC)**: Developed by the Tank, and Automotive Research, Development and Engineering Center (TARDEC), it integrates Commercial and Government off-the-shelf (COTS and GOTS, respectively) tools to provide a common information model with web-enabled collaborative space and high quality data visualizations. The framework functionality includes a capability analysis tool to decompose operational requirements into system requirements, with traceability of system requirements to their source.

1.5.1.3 Decision Model Based Systems Engineering (DMBSE)

To fully comply with the Weapon Systems Acquisition Reform Act (WSARA) of 2009, the DOD R&D community must develop and demonstrate an in-depth understanding of the complex relationship between requirements, the design choices addressing each requirement, and the system-level consequences of all design choices on performance requirements and other stakeholder values, such as cost and schedule. The Research, Development, and Engineering Command (RDECOM), in collaboration with academia and industry partners, is developing an SE trade-off analysis methodology that enables the R&D community to assess a large set of alternatives across competing objectives of performance, acquisition cost, operating and support costs, schedule, and enduring viability. The emerging methodology is being called DMBSE and will explore trade-space as requirements and system design approaches are being refined early in

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the acquisition process. DMBSE's data visualization and sensitivity analysis capability have strong explanatory power, giving decision makers a robust understanding of the complex trade-space needed to inform requirements and make fact-based decisions throughout the acquisition lifecycle.

1.5.1.4 Architecture & Analysis Team for Force Basing (AATFB) Portfolios

In FY13, the Force Basing Architecture (FBA) Branch utilized DP and Portfolio Development processes to produce integrated SoS portfolio designs. Their analysis and design work produced portfolios for the enterprise functional areas of Integrated Base Defense (IBD), Communications and Computing Infrastructure (CCI), and Base Infrastructure (BI), which later was renamed CBI. The FBA transitioned all three designs to Trail Bosses, designated by the ASA(ALT)/AAE, to implement the designs. The SoSE&I Functional Technology Lead (FTL) provided a tailored review of the BI OCONUS Semi-Fixed Sites (Base Camps) FY16 Portfolio Final Report and identified potential areas for future S&T investment.

1.5.1.5 PEO Efforts

Additional key PEO/PM DP efforts include:

PEO Ammo uses the Key Parameter Development & Management (KPD&M) Process to identify potential trades between capability and costs, schedules, and/or performance risks. PEO Ammo is implementing consistent disciplined risk management processes and conducts monthly risk management meetings to enable leadership to conduct fact based trades between cost, schedule, and risk.

The JPEO CBD Joint Project Manager for Protection developed a requirements traceability matrix (RTM) and performed detailed analysis to identify requirements to stakeholders that did not logically align with their Concept of Operations (CONOPS). This led to a decision to not pursue objective requirements that would have significantly increased the program's cost and schedule.

1.5.1.6 Army Technology Maturation Initiative

The Army Technology Maturation Initiative was established in FY12 to create a strategic partnership between Science & Technology and the acquisition community to facilitate the transition of high-payoff technologies into planned or existing programs of record through technology maturation and competitive prototyping prior to Milestone (MS) B. Executed by the authorities of the Deputy Assistant Secretary of the Army (Research and Technology) (DASA(R&T)), this Budget Activity 4 (BA 4) funding provides a mechanism to improve the

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alignment between S&T and acquisition, as well as to address the risk-reduction goals laid out by the WSARA and DODI 5000.02. Activities under this program focus on:

- Maturing S&T products (goal Technology Readiness Level (TRL) 7) to increase transition success.
- Enabling high-payoff, competitive prototyping earlier in the acquisition lifecycle (prior to MS B).
- Adopting acquisition rigor for mature S&T efforts.
- Informing materiel requirements to expedite capabilities to the Warfighter.
- Reducing technology risks for acquisition PoRs.

In FY12, five Technology Maturation Initiative efforts were selected for initiation. While experiencing some delay due to reduced funding, continuing resolution and sequestration impacts, these two-year efforts continued their planned technology maturation and transition activities in FY13, and have or will complete by early FY14. These efforts are informing capability requirements and delivering matured, advanced technology prototypes at reduced size, weight and power for integration into the Nett Warrior, Joint Tactical Radio (JTR), Joint Effects Targeting System, and Family of Weapons Sights (FWS) acquisition programs.

Efforts receiving Technology Maturation Initiative funding are selected by an Executive Steering Group of Army stakeholder leadership. Beginning in FY15, the Army is aligning the Technology Maturation Initiative selection process to the budget development process. This will enable priority investment areas for the Technology Maturation Initiative to be reflected in the Defense budget justification documents.

1.5.2   Workforce Development Initiatives

SoSE&I is the functional lead for acquisition career field Engineering development activities. SoSE&I has undertaken an expanded workforce development effort, with the intent to develop a premier Acquisition SE workforce able to drive success in the Army's most challenging engineering endeavors. FY13 marked a significant improvement in coordination among the multiple organizations that oversee aspects of the civilian workforce, leading to agreement on establishment of a board that will oversee SE workforce development. The establishment of a proponency office for Career Program 16 (CP16) Engineers and Scientists (Non-construction), expected in FY14 under Army Materiel Command, will facilitate improved communication with the SE workforce regarding the Army's strategy for their development and utilization, as well as their career opportunities. There are six key initiatives to address a foreseen shortfall in the SE workforce:

- Selecting personnel for Key Leadership Positions (KLPs)

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- Systems Engineering Governance Board (SEGB)
- Specialty Engineering Education and Training (SE2T) Program
- Systems Engineering Research Center (SERC) Initiatives
- Rotational Assignments
- Developing Training Opportunities

1.5.2.1   Key Leadership Positions (KLPs)

SoSE&I is collaborating with the Acquisition Support Center (ASC), AMC, OSD, and other Services to select qualified personnel to fill KLPs. Currently, KLPs must have the following qualifications: Defense Acquisition Corps Membership, Level III Certification and a Tenure Agreement. To aid in evaluating and selecting the best qualified KLP candidates, the Army developed criteria in five areas to assist supervisors in selecting personnel to fill KLP vacancies: education, experience, cross functional competencies, tenure, and currency.

1.5.2.2   Systems Engineering Governance Board (SEGB)

The Army is in the process of establishing the SEGB to provide steering and governance, policy oversight, metrics establishment, and priority identification to support SE workforce development efforts. The board will be co-chaired by ASA(ALT) and the Army Materiel Command (AMC). The SEGB will oversee initiatives to "build-the-bench" of systems engineers, such as the SERC SE career development model, the SERC Helix project, and the SE2T program.

1.5.2.3   Systems Engineering Research Center (SERC) Support

The Army is collaborating with the SERC, a University-Affiliated Research Center of the DoD, to develop an SE career development model based on best practices gleaned from industry and academia. The model will address the education, training, and experience necessary to grow systems engineers from entry level to KLPs. AMC's RDECOM collaborated with the SERC to develop the Systems Engineering Advanced Course, which was transitioned to trainers within each RDEC for all future offerings. The course is expected to be offered semi-annually, beginning in FY14.

In addition, ASA(ALT) and AMC-RDECOM are key participants in the DOD-sponsored Helix study, which reviews the health of the SE workforce and identifies areas for potential improvement. The goal of the study is to provide conclusive results to DOD leadership and inform decisions on the path forward for improving the SE workforce.

1.5.2.4 Specialty Engineering Education and Training (SE2T)

SE2T is a two year program created by AMC-RDECOM, in partnership with the DAU, to rebuild the competencies for specialty engineering. The coursework trains interns/new hires in the broad engineering skills needed to support Army acquisition. The courses address expertise gaps in quality, production, manufacturing, reliability, and T&E engineering.

In FY13, SoSE&I enhanced the SE2T program by adding courses tailored for the current workforce. These courses provide refresher training in the key specialty engineering areas. Also, the Army expanded the program by establishing distance learning classrooms in Aberdeen, MD; Edgewood, MD; and Warren, MI.

1.5.2.5 Rotational Assignments

Providing the SE workforce with multiple rotational and developmental assignments will be a key focus area of SE workforce development in FY14. The objective is to enhance SE by creating an environment that allows systems engineers to gain operational experience in multiple organizations, and broaden their breadth of knowledge.

To support this objective, SoSE&I is establishing a developmental assignment program that will identify qualified candidates and provide them the opportunity to work for SoSE&I in 6 month developmental assignments in the National Capital Region (NCR).

1.5.2.6 Recruitment and Training

The Army recognizes the challenge to retain, recruit and train systems engineers. In an effort to recruit qualified applicants and then continue to develop their skills once hired, the Army maintains consortiums with universities. For example, AMC-RDECOM entered its final year of partnership with the Naval Post Graduate School to sponsor 23 engineers to obtain System Engineering Master of Science degrees in FY13. The AMC-Edgewood Chemical Biological Center (ECBC) has reached an agreement with Johns Hopkins University to provide a single, limited participant *Introduction to Systems Engineering* course.

The Army also continues to strengthen the current workforce through training and professional certification. Some examples include:

- Defense Acquisition Workforce Improvement Act (DAWIA).
- Agency and Service reliability and maintainability training.
- Lean Six Sigma training and certifications
- Certification as Certified Reliability Engineers (CRE) through civil organizations.
- Publishing technical articles.

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1.5.2.7 PEO Efforts

PEOs/PMs are responsible for ensuring their workforce has the required certifications and qualifications for their positions. In addition to aggressive recruitment, smart personnel allocation, top down mentoring programs, and student opportunities, PEOs/PMs fulfill this directive through collaborative relationships with engineering centers to sustain matrix support; mandatory acquisition career field Engineering certification; and expanding training opportunities for existing SE employees, to include encouraging the workforce to pursue Master's and Doctorate Degrees in their respective fields.

Collaborating with engineering centers to matrix SME resources allows PEOs/PMs to augment the current workforce with desired expertise and skill sets. The engineering centers, such as AMC-RDECOM, benefit from the exchange as it serves to provide their personnel with career broadening experiences.

1.5.3 Common SE Practices

1.5.3.1 Common Tools/Convergence

The AMC-RDECOM continued efforts within the SE IPT across the command including assessing how each RDEC/Army Research Laboratory (ARL) conducts SE processes. The AMC-RDECOM SE IPT identified 30 process areas for potential convergence on a common approach that would improve effectiveness and efficiency. Efforts to address the six highest priority areas for commonality were initiated: development of an Army Lexicon, define what a SE is at AMC-RDECOM to support workforce development plans, documenting internal and external stakeholder communication roles and responsibilities, identifying recommended COTS and GOTS for requirements management, developing a template approach to document lowest-level and component addition and/or revision integration, and disseminating Project Plan updates to keep project leaders aware of changes.

1.5.3.2 ASA(ALT) & G-8 Portfolio Management Alignment

SoSE&I is working on an enterprise knowledge center (KC) to enable SoS Architecture Based Portfolio Management (PfM) within ASA(ALT). This SoSE&I KC, addressing gap analysis and requirements definition work, enables effective, efficient portfolio management across SoS architectures utilizing common tools and common authoritative data in the PfM process. The SoSE&I KC avoids dependency on a new tool or proprietary mechanism, but applies and leverages the HQDA G-8's pre-existing knowledge environment, tailored to ASA(ALT) unique missions.

1.5.3.3 Integrated Requirements Framework (IRF)

The Army IRF enables collaborative development, management, and analysis of requirements (e.g. warfighting capabilities, SoS and system requirements) across the entire Army community. The Army IRF requirements are organized into a schema based upon the current TRADOC and ASA(ALT) organizational structures, and while tool agnostic, the Army IRF schema has been implemented using IBM's Dynamic Object-Oriented Requirements System (DOORS) toolset. This schema facilitates requirements developers to maintain control over their requirements data, yet build traceability to other requirements or information within the environment.

In FY13, the Army IRF was populated with requirements documentation pertinent to Mission Command Applications, and the team implemented a process to assess commonality across requirements during a pilot for the Mobile/Hand-Held (M/HH) Computing Environment (CE).

1.6 Progress and Improvements for System of Systems (SoS)

SoSE&I responsibilities under Army Regulation (AR) 70-1, as delegated by the Army Acquisition Executive (AAE), are to develop, implement, and maintain a guiding document for Army SoS acquisition planning and synchronize PEO/PM SE plans to ensure common execution across the Department of the Army (DA). This organization distinguishes between SoS engineering executed at the Headquarters of the Department of the Army (HQDA) staff level from the SE activities executed at the PEO/PM level. This enables synchronization between SoS engineering and PEO/PM SE plans to ensure common execution across the Army. SoSE&I provides the forums and processes to define and balance system performance, cost, schedule, and risk within a family-of-systems and SoS context; complementing the SEP that PEOs/PMs produce.

PEO's are responsible for integrating their portfolio of systems to achieve the capabilities assigned to that PEO. However, SoSE&I and the PM continue to play an important role in supporting the PEO's execution strategy.

SoSE&I performs multiple functions that support the Army Capability Integration Strategy. The Army fields capabilities to the force through the Capability Set Management (CSM) Process. A Capability Set (CS) provides the platforms, network, mission command systems, and other technologies needed by a formation to achieve its mission. Each CS is further refined as an Operational Capability Set (OCS), an Institutional Capability Set (ICS), or a Network Capability Set (NCS), depending on what formation the CS supports.

CSM is implemented through the SoS engineering process, enabling the alignment of multiple CS fielding evolutions against a long-range capability objective, such as LandWarNet (LWN) 2020. This shifts the focus of SoS development from a short-term target—i.e., a single CS

fielding for a specific formation type—to a strategic, long-range target that incrementally delivers common capabilities across the Army. While the individual systems fielded in any given CS will be different depending on the type of formation and the mission/threats facing that formation, the SoS engineering process ensures that the types and quality of systems fielded across multiple formations over time are synchronized to provide the desired end-state capability.

1.6.1   SoS Engineering Management Plan (SoSEMP)

The SoSE&I Directorate is responsible for Army strategic SE focused on enabling optimized delivery of integrated materiel solutions to the Army for current and future force capabilities. Recognizing the need for a standardized, department-level SoS engineering approach, and in accordance with AR 70-1, ASA(ALT) initiated an effort to define the Army SE process by drafting a SoSEMP in January 2013. The SoS engineering process represents the first strategic, cross-cutting approach spanning the entire acquisition process. The SoS engineering process, and the accompanying SoSEMP, serves as the guiding document for Army SoS strategic SE to help synchronize SE activities across the Army, to include acquisition planning, roadmap development, and governance. It addresses the full range of SE activities including technical management planning, risk management, configuration management, test and evaluation (T&E), design verification, and other technical activities. The first draft of the SoSEMP was published on 1 August 2013, and is being socialized through the Army's PEO and RDEC communities, as well as appropriate academic and industry associations.

1.6.2   LandWarNet (LWN) General Officer Steering Committee (GOSC)

SoSE&I supports the LWN Mission Command (MC) decision forums, led by Army G-3/5/7, by providing technical and staffing guidance for the Materiel Developer community of interest. SoSE&I coordinates COE, NCS, and Force Basing initiatives across the Army acquisition community to ensure integrated solutions are fielded to the Soldier, cost goals are met, and efficiencies realized.

1.6.3   System of Systems (SoS) General Officer Steering Council (GOSC)

The SoS GOSC, chaired by the Deputy for Acquisition and System Management (DASM) and boasting principals from PEOs and HQDA staff, shapes and synchronizes the development, production, and fielding of integrated, materiel capabilities for the Army Materiel Enterprise at the executive level. The SoS GOSC acts on behalf of the ASA(ALT)/AAE to build consensus across Army organizations, adjudicate cross-PEO technical issues, capture issue positions of principal members and stakeholders, and provide recommendations for decision.

1.6.4   Army Business Council (ABC)

The ASA(ALT)/AAE is a core voting member of the ABC, which is a key business decision forum that reviews, issues policy, and makes recommendations on potential Army investments in business systems. The Army continues to execute its Business System Information Technology (BSIT) strategy, focused on improving business operations through end-to-end business process improvement and through effective portfolio management of the supporting IT systems. ASA(ALT) is the Process Champion for six of the end-to-end processes and manages a systems portfolio by providing acquisition support. Successful streamlining of end-to-end processes requires application of SoS engineering principles and practices.

1.6.5   Organizational/System Architecture (OA/SA) Working Group

The OA/SA working group facilitates Integrated Architecture Collaboration between TRADOC and SoSE&I. TRADOC develops, validates, and implements Organizational Based Architecture and manages the Army Common Architecture Development and Integration Environment (ArCADIE). SoSE&I oversees the ArCADIE structure, provides oversight/support for the transition of the Basis Of Issue Feeder Data (BOIFD) into the ArCADIE database, and acts as the gatekeeper of data into the BOIFD and its integration into Capability Set (CS) Reference Architectures (RAs).

1.6.6   Common Operating Environment (COE) Governance

The Army is executing the COE mandate by establishing Common Foundation objectives and support standards, implementing the Common Foundation across systems, and identifying opportunities to reduce costs. In FY13, the Technical Advisory Board (TAB) approved the System Migration Binning List (SMBL) that bins PoRs into one of the six Computing Environments, providing them with an anchoring point for Control Point Specifications, standards application, and testing. The following COE governance, test, and integration documents are in development:

- COE integrated SEP
- Army COE Policy, which replaces the Army Software Blocking Policy.
- COE Charters to support the SoS GOSC and the TAB.
- An SoS GOSC and COE SOP.
- COE Technical Roadmap, which maps COE baselines over the FY12-18 timeframe.
- COE Integrated Master Schedule (IMS) for baselines v1.0-3.0.
- Appendix C of the LandWarNet (LWN) 2020 and Beyond Enterprise Architecture.
- Preliminary CE Interface CPSs.

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1.6.7 Common Operating Environment (COE) Pilot Program

The COE Pilot Initiative will assist in determining a faster, simpler, and reduced cost COE software technical baseline. The COE Pilot is a risk reduction demonstration that proves interoperability between Command Post, Mounted, and Mobile CEs. It will demonstrate a common shared geospatial capability, enable a common identity and access management service solution across the CEs, enable collaboration (Chat, Email), provide Unified Data capability, provide joint interoperability with JIIM organizations, and enable a rich web client framework solution.

1.6.8 Force Basing

The Army renewed the force basing charter on 6 September 2013. In addition to producing Integrated Base Defense (IBD), Communications/Computing Infrastructure (CCI), and Contingency Base Infrastructure (CBI) Reference Architectures (RAs), the Force Basing Architecture (FBA) Branch developed the FY16 LWN Network Capability Set (NCS) SoS RA, in conjunction with the Army Chief Information Officer (CIO)/G-6. In FY13, FBA efforts were endorsed by the Service and Infrastructure Core Enterprise (SICE) Board. With this endorsement in-hand, the Army G-3/4 (Protection) is now working with the FBA Branch as the materiel arm of the Army Protection Program.

1.6.9 Army Geospatial Enterprise (AGE)

During FY13, ASA(ALT) SoSE&I, in coordination with the United States Army Corps of Engineers (USACE), completed Mounted and Command Post (CP) Computing Environment (CE) trade studies to support the development of common geospatial material solutions. SoSE&I also began developing an AGE Architecture, synchronized a data strategy with the National Geospatial-Intelligence Agency (NGA), updated the Ground-Warfighter Geospatial Data Model, coordinated with the National System for Geospatial-Intelligence (NSG), provided geospatial support to the NIE, and provided recommendations for the Single Geospatial Foundation and Common Overlay Cross Cutting Capability (CCC).

1.6.10 Open System Architecture (OSA)

Open Systems Architecture (OSA) benefits PMs by re-using established and working framework components to add features to address evolving threats to an already tested, fielded, and working component. In FY13, the Army, as a participant in the DOD OSA/Data Rights (DR) Working Group, published an OSA Contract Guidebook to the community. The guidance specifies best practices for writing OSA requirements and data deliverables into contracts. The group also developed guidance for inclusion in the DAG and revised DODI 5000.02.

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1.6.11 VICTORY and FACE Architecture Standards

In FY13, the Army expanded the content and scope of the Vehicular Integration for command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR)/Electronic Warfare (EW) Interoperability (VICTORY) effort, which is an architecture and a standard set of specifications that facilitate interoperability and reduced platform integration risk. A reusable software reference library was established, and contains both application interface code to assist developers in implementation of the VICTORY Standard and Verification Toolkits to test component compliance. The approval of the VICTORY Management Directive, Process Document, and Configuration Management Plan established a management structure for the Standards Body and overall initiative.

The Army also pursued the development and implementation of the Future Airborne Capability Environment (FACE), which establishes a standard COE to support portable capability applications across DOD avionics systems. Both VICTORY and FACE provide improved system engineering standards that can reduce the total time programs of record require to design, implement, deliver, test, and field new, enhanced, and/or additional capabilities to the Warfighter.

1.6.12 Sensor Mission Package Integration and Alignment of Architectures

The Army is establishing DODAF Reference Architecture products, as well as Integration Strategy analysis and recommendations to support the alignment and integration of Non-Standard Equipment (N-SE) based sensor systems under the IBD Kitting Activity. The team coordinated efforts with key stakeholders to bridge the gap between the interim Kitting activity and an enduring IBD capability. The group's focus is on sensor systems capabilities related to relevant future mission threat areas and the ability of existing N-SE sensor systems to meet these requirements.

1.6.13 Intra-Soldier C4ISR Systems Capabilities Development

The Army has initiated an effort to align Intra-Soldier C4ISR systems to support future CSs, which will provide Team Leader (TL)-level analysis within BCT beginning with the CS14 BOI. In FY13, the team focused on S&T initiatives and aligning and integrating critical C4ISR systems that support squad overmatch.

1.6.14 SoS Transport Architectures and Network Design Optimization

The Army continues to develop SoS Transport Architectures for tactical networks, directly affecting CS14 Synchronized Fielding and beyond. RAs for all networked transport systems for CS14 were defined and used to determine the full SoS network design parameters for the next

CSs. Additionally, the RA and BOI Planning (BOIP) have been consumed and used to develop implementation/solution architectures for networked transport systems for the particular units and formations for CS14. The Army is looking beyond CS14 and is preparing reference architectures and initial BOIP data for CS15+.

1.6.15 Always On–On Demand (AO-OD)

The "AO-OD" initiative integrates existing live, virtual, and constructive systems to create a realistic synthetic operational environment, available on demand. An AO-OD environment will enable the SE workforce to perform Network Modernization research, development, test, assessment, and experimentation in a relevant environment using significantly less resources than currently required. In FY13, the AO-OD team developed an NIE 14.1 prototype, utilizing the current core Joint Network Emulation (JNE) capability. Being developed through the Business Capabilities LifeCycle (BCL) programmatic approach, the AO-OD effort is consistent with the Army's Test and Evaluation Enterprise Strategic Plan 2013 and the Army's Agile Capabilities Life Cycle Process SOP.

1.6.16 Agile Process

The Army has adopted the network integration "Agile Process," which provides a holistic and integrated approach for the acquisition, testing, evaluation, and fielding of capability solutions across the Army's range of operations. The Agile Process, through seven procurement phases, is an effort to procure critical capabilities more rapidly, while ensuring technical maturity and integration, and reducing the integration burden from deployed units and Soldiers. The phases focus on identifying requirements and potential solutions, assessing potential solutions in both a laboratory and operational environments, and applying analysis results to TRADOC's Doctrine, Organization, Training, Materiel, Leadership Development, Personnel, and Facilities report. These phases are continuous in nature and react to external changes from ongoing operations, advances in information technology and traditional analysis the Army conducts to modernize the force for the future. While the phases imply a linear Network development approach, all are collaborative in nature and continuously inform each phase.

1.6.17 Network Integration Evaluation (NIE)

A key component to the Agile Process are Soldier-led NIEs, which represent a realistic combat environment, allowing full use of the network from the team-level to Brigades and above echelons. In FY13, the Army executed multiple NIEs, soliciting SE solutions through early evaluation and leading systems integration and configuration management across the Army. SoSE&I integrates and synchronizes services and support to all Army and Industry participants, and provides the Acquisition Community with a single interface to the Test Community, the ATEC, and the User community. In FY13, the Army improved the accreditation process for

systems participating in NIEs, closed out NIE 13.2 and conducted final preparation for 14.2, incorporated Bold Quest into NIE 14.1, and source selected NIE candidates for 14.1, 14.2, and 15.1.

1.6.18 Capability Set Management Board (CSMB)

SoSE&I manages the CSMB Working Group cooperatively with G3/5/7. The board coordinates all technical cost and performance issues with other stakeholders, PEOs and PMs to manage Basis of Issue (BOI) Feeder Data (FD) products, which are used to build the BOI plans and RAs that inform CS BCT synchronization and fielding.

1.6.19 Capability Set (CS) Fielding

The Army fielded CS13 to four Brigade Combat Teams (BCT), completing the first iteration of the Agile Process. The PD Synchronized Fielding, based on NIE results, integrated and vetted CS13 network packages into the MRAP All Terrain Vehicles (ATV). The second iteration of the Agile Process is coming to fruition with the development of CS14, which delivers capability improvements for Infantry BCTs (IBCTs), Stryker BCTs (SBCTs), and Division headquarters (HQ). The CS14 Network Design Book (NDB) and Final Report were completed in FY13 and the CS introduces the Handheld, Manpack, and Small Form Fit (HMS) radio into the formation.

1.6.20 Platform Integration Analysis

The Platform Integration & Analysis (PIA) IPT developed new policies, processes, and tools— such as an authoritative Size, Weight, and Power-Cost data repository—to ensure integration constraints and issues for platform and CE-supportable solutions are properly vetted and adjudicated across PoRs. The PIA IPT drafted a SoS Platform Integration Plan (PIP) that defines and quantifies the processes and policies necessary to adequately address platform constraints through a collaborative process between the CE leads, PEOs, and PMs.

1.6.21 Configuration Control

SoSE&I synchronizes the configuration of data and artifacts to provide data fusion, collaboration, and data retrieval, supporting effective and efficient portfolio management across ASA(ALT). Configuration Control performs an essential function in support of CS fielding. A brigade fielded as part of CS13, for example, will have a unique SoS architecture, one that may be fundamentally different from a unit architecture fielded in CS17. Authoritative data associated with both CS13 and CS17 units are critically important to the management of Army-wide acquisition in an environment of varied unit designs. Configuration Control similarly enables decision management and decision tracking, tasks that are necessary to ensure changes

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and decisions are shared with and discoverable by PEOs in a timely manner, avoiding the risk that a PEO may build to outdated specifications.

1.6.22 Network Operations (NetOps)

ASA(ALT) co-chairs the NetOps IPT with CIO/G-6, annually developing architecture products that define initiatives and shape policy and doctrine to integrate the NetOps with the battlefield. In addition, in FY13, the NetOps IPT provided significant feeder data to the LWN Initial Capabilities Document (ICD) and the Integrated Tactical Networking Environment (ITNE) CDD.

1.7 Additional SE Accomplishments

Additional notable PEO/PM FY13 accomplishments include:

- PEO AVN Utility Helicopters Project Office (UHPO) established a Systems Integration Branch to support material change development efforts, ensuring they meet stakeholder and PM cost, schedule, and performance expectations.
- PEO CS&CSS PAWS implemented the Multi-User ECP Automated Review System (MEARS) for configuration management control and tracking.
- PEO CS&CSS has consolidated the oversight and reporting of the VE, Lean Six Sigma/Continuous Process Improvement, and Better Buying Power programs under SE, reducing duplication.
- PEO CS&CSS implemented a Risk Management process for documenting and reporting risk, risk drivers, and risk mitigation.
- PEO Soldier established the Synchronization Modernization Process (SMP) which brings together the requirements, science and technology and materiel developers in planning the Soldier strategy out to 2048.
- PEO STRI developed the SE Index, an electronic repository of the latest acquisition governance and documentation. PEO STRI awarded an Agile Software Development SoS integration project contract, marking the first agile development contract awarded in the PEO.
- JPEO CBD Software Support Activity upgraded the vendor System Architecture software and Services that supports enhanced requirements and data modeling with DODAF 2.0.

1.7.1 Army Systems Engineering Forum (ASEF)

The monthly ASEF allows PEOs/PMs, AMC-RDECOM Chief Systems Engineers, Chief Software Architects and key members of the Army's engineering and software community to

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socialize key SE concepts and strategies, identify and address common SE issues, and identify solutions. Key topics for the FY13 ASEF forums included:

- SEP development training by DASD(SE)) Major Program Support (MPS) office
- Engineered Resilient Systems (ERS) initiative
- Army Product Data and Open System Architecture (OSA)
- Quantifying the Effectiveness of SE study results
- Integrated Model Based Systems Engineering (MBSE) Development Environment
- Acquisition Career Field Engineering Functional IPT Update and Workforce Update
- Army Integrated Requirements Framework (IRF)

1.7.2 Product Data and Data Rights

Army programs continue to face increased program costs due to the lack of product data and/or data rights needed to competitively procure and support their products. The RDECOM (ARDEC) provides technical and subject matter experts to SoSE&I and HQ AMC, and representatives participate in Army and DOD working groups that address the issues of product data and data rights acquisition and management. ARDEC efforts in this area include:

- Chairing the Army Product Data & Engineering Working Group (PEWG).
- Training Programs and Project Teams on acquisition and management of product data and data rights.
- Implementing a strategic initiative to consolidate disparate ARDEC weapon system development IT environments into a common Product Data Management (PDM) environment that interfaces with the Army Logistics Modernization Program (LMP).
- Serving as primary Army representative on a joint Service effort to develop a DOD addendum to an industry standard for Configuration Management (CM).
- Updated the DOD 5010-12-M manual that provides guidance for proper acquisition of data on contracts.
- Evaluated several program Performance Based Logistics (PBL) Business Case Analyses (BCAs) for impacts of technical data and data rights renewal on PBL contracts.

1.7.3 Information Assurance

Information Assurance (IA) support teams continue to support the Army Agile process, to include Synchronized Fielding, Lab-based Risk Reductions (LBRRs), and NIEs. In FY13, the Army coordinated Blue teaming earlier in the Agile process by integrating 1st Information Operations Command into the LBRR to validate IA protection mechanisms, monitor capabilities, and validate Host Based Security System (HBSS) architectures of the NIE. The HBSS automates the waiver and exemption process for PEO and PM managed systems.

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1.7.4   Value Engineering (VE)

The Army VE program continues to lead all other DOD agencies in net savings and cost avoidance, as well as aggressive and entrepreneurial efforts focused on the Army's primary commodity areas. With the consolidation of the Value Engineering Management System (VEMS) into the Army Power Steering (PS) system the Army is beginning to load VE project data into PS. A draft guidance document, providing in-depth instructions for the reporting and capturing of critical VE project accomplishments is in beta test, and PS is now providing the essential data analysis needed to track and manage VE program results. Using PS is advantageous because SW hosting and administrative costs associated with VEMS has been avoided in FY13 and there is a much lower probability of duplicating cost savings reports, as both Lean Six Sigma and VE cost savings and cost avoidance data are now captured in the same system.

2.   Army SE Workforce

Effective FY14, the acquisition career field Systems Planning, Research, Development and Engineering-Systems Engineering (SPRDE–SE) was renamed to acquisition career field Engineering (ENG).

2.1   Defense Acquisition Workforce Initiatives

Section 852 of the FY08 National Defense Authorization Act (NDAA), Public Law Number 110-181, directed the establishment of the Defense Acquisition Workforce Development Fund (DAWDF), which funds DOD efforts to recruit, hire, train, develop and retain its Acquisition workforce. In April 2009, the Secretary of Defense (SECDEF) directed the growth of 20,000 defense acquisition workforce positions by FY15. The DOD (Carter-Hale Numbers) allocated 1,856 new hire positions to the Army Acquisition community, which were funded with Section 852 funds. The DAWDF funding is used for salary for new-growth positions, limited to the first two years.   In cases where the number hired falls short of the number allocated, it is normally due to a hiring freeze. Table 2-1 provides FY09-13 Hiring authorities.   For FY14-15, the ENG community has been allocated funding to hire 43 civilians.

Table 2-1 Historical Section 852 Hires

FY	Intern Positions				Journeyman Positions			
	SE		PSE		SE		PSE	
	Allocated	Hired	Allocated	Hired	Allocated	Hired	Allocated	Hired
FY09	14	14*	0	0	11	9	0	0
FY10	20	22*	0	0	0	13**	0	0
FY11	6	15	0	0	0	15	22	0
FY12	2	2	0	0	0	0	2	2
FY13	3	2	N/A	N/A	19	3	N/A	N/A

* In FY09 & FY10 – one intern departed early

* In FY10 – three journeyman departed early

2.2 SE Workforce Resourcing

As of 31 December 2010, the Secretary of the Army has put on hold all acquisition civilian conversion (in-sourcing) efforts until appropriate justification can be made for increases to the civilian structure. These policy memos put our contractor-to-civilian conversion efforts on hold until further notice. The Army does not require any additional authorities that are not currently assigned by Title 10 to support management of the acquisition workforce.

2.3 Budget Impacts

Overall budget cuts have and will continue to have an impact on the Army's Acquisition workforce and developing internal core Systems Engineering (SE) expertise. Within the SE community, increased rate of retirement of experienced systems engineers and analysts has resulted in a projected shortfall of qualified senior level SE leaders within the next five-to-ten years. While past decades have seen expertise retire, the lack of government SE employment opportunities under hiring freeze constraints, the perceived instability of government employment due to large budget cuts, and a lower expectation of promotion potential has young engineering professionals pursuing private industry opportunities. The degradation of the quality and morale of the current SE workforce will contribute to additional SE competency gaps if not addressed in the near future. It will be challenging to fill critical Key Leader Positions (KLPs) or establish new Government positions for new programs in the current fiscally constrained environment.

Continuing budget cuts have had an effect on collaborative efforts across the community because of reduced or suspended travel that cannot be justified as mission essential. While video and

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telecommunication technologies allow personnel from across the United States to collaborate virtually, the limited travel to contractor facilities and attendance at Systems Engineering Conferences has constricted the exchange of ideas between the Army and our Industry and other Service colleagues. Budget cuts are also driving hiring freezes, which places a significant increased workload burden on a relatively small core staff. Furloughs and sequestration-based layoffs have greatly impacted productivity, even though many personnel put in additional effort to accomplish the mission and support the Warfighters. Furloughs, budget cuts, lack of raises, hiring freezes, and looming retirements of senior personnel have all resulted in greatly increased stress and reduced morale upon the SE workforce.

There is growing concern that sustainability within the Reliability community will be the first to be adversely impacted from further cuts. For most organizations the Reliability and Testing teams are relatively small. Budget cuts and the reduction of number of programs conducting for record tests will erode the institution knowledge within this specialty function. As subject matter experts retire, transition to industry, or move to other fields because of fewer opportunities, the pace of this erosion will be directly proportional to the budget and funding levels in the future.

2.4 SE Workforce Positions in the Army

During FY13, the total acquisition workforce assigned to SPRDE-SE/ENG positions decreased from 9,812 in FY12 to 9,374 in FY13. The primary reasons contributing to this decrease were continued personnel losses associated with Voluntary Separation Incentive Pay, Voluntary Early Retirement Authority, and other types of attrition.

Additionally, target hiring levels for civilian acquisition workforce personnel in the ENG career field have been reduced due to budgetary impacts, described above. Military positions coded Engineering are expected to remain steady.

Table 2-2 Number of SPRDE-SE Personnel

Total Number of Civilian and Military Acquisition - SPRDE-SE Personnel		
Fiscal Year	**Year Ending**	**US Army**
FY05	30-Sep-05	11,138
FY06	30-Sep-06	11,964
FY07	30-Sep-07	11,050
FY08	30-Sep-08	10,769
FY09	30-Sep-09	10,208
FY10	30-Sep-10	10,647
FY11	30-Sep-11	10,071
FY12	30-Sep-12	9,812
FY13	30-Sep-13	9,374

Table 2-2 source of data is CAPPMIS, as of 30 September 2013

Table 2-3 Planned Personnel Growth

Planned Growth in Civilian and Military Acquisition-Coded SPRSE SE			
Fiscal Year	**Year Ending**	**Planned Growth**	**Projected End Strength**
FY14	30-Sep-14	22	9,396
FY15	30-Sep-15	21	9,417
FY16	30-Sep-16	0	9,417
FY17	30-Sep-17	0	9,417
FY18	30-Sep-18	0	9,417
FY19	30 Sep 19	0	9,417

Table 2-4 Number of Non-Government SE Support Personnel

Total Number of Non-Government SE Support Personnel (FTEs)				
Fiscal Year	**Year Ending**	**Product Service Code**		**US Army Total**
		R414	**R421**	**R425**	
FY10	30-Sep-10	1,142	1,026	8,119	10,287
FY11	30-Sep-11	868	1,037	12,001	13,906
FY12	30-Sep-12	590	1,246	11,197	13,033
FY13	30-Sep-13				Not Available Until Mid-2014

Table 2-4 source of data is the Defense Procurement & Acquisition Policy (DPAP) Website

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Acronym List

Acronym	Definition
A/C	Air conditioning
AAE	Army Acquisition Executive
ABC	Army Business Council
ACAT	Acquisition Category
ACP	Army Campaign Plan
ACTEDS	Army Civilian Training Education Development System
AEC	Army Evaluation Center
AFATDS	Army Field Artillery Tactical Data System
AGE	Army Geospatial Enterprise
AIP	Automotive Improvement Program
AMC	Army Materiel Command
AMPV	Armored Multi-Purpose Vehicle
AMRDEC	Army Aviation and Missile Research Development and Engineering Center
AMSAA	Army Materiel Systems Analysis Activity
AoA	Analysis of Alternatives
AO-OD	Always On-On Demand
AR	Army Regulation
ArCADIE	Army Common Architecture Development and Integration Environment
ARCIC	Army Capabilities Integration Center
ARDEC	Armament Research, Development and Engineering Center
ARL	Army Research Laboratory
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASC	Acquisition Support Center
ASEC	Advanced Systems Engineering Capability
ASEF	Army Systems Engineering Forum
ATC	Army Training Center
ATEC	Army Test and Evaluation Command
ATV	All Terrain Vehicles
AVN	Aviation
AW	Air Warrior
AW	alternative warhead
BCA	Business Case Analyses
BCL	Business Capability Lifecycle
BCT	Brigade Combat Team
BI	Base Infrastructure
BOI	Basis of Issue
BOIP	Basis of Issue Plan(ning)
BSIT	Business System Information Technology
C2	command and control
C3T	Command, control, communications-tactical

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Acronym	Definition
C4ISR	Command, control, communications, computers, intelligence, surveillance, and reconnaissance
CAAMLL	Center for Army Acquisition and Materiel Lessons Learned
CBI	Contingency Base Infrastructure
CCC	Cross Cutting Capability
CCI	Communications and Computing Infrastructure
CCIR	Commander's Critical Information Requirements
CDD	Capability Development Document
CE	Computing Environments
CES	Civilian Education System
CIO	Chief Information Officer
CIRCM	Common Infrared Countermeasure
CM	Configuration Management
CoE	Center of Excellence
COE	Common Operating Environment
CONOPS	Concept of Operations
COTS	Commercial off-the-shelf
CP	Command Post
CPAT	Capability Portfolio Analysis Tool
CPD	Capability Production Document
CPS	Control Point Specifications
CRE	Certified Reliability Engineers
CRG	Center for Reliability Growth
CRP	Contract Requirement Package
CS	Capability Set
CS&CSS	Combat Support and Combat Service Support
CSB	Configuration Steering Board
CSMB	Capability Set Management Board
CSPAR	Common Standards, Products, Architectures, and Repositories
CTO	Chief Technology Office
CY	Calendar Year
DAES	Defense Acquisition Executive Summary
DAG	Defense Acquisition Guidebook
DAL	Data Accession List
DASD	Deputy Assistant Secretary of Defense
DASM	Deputy for Acquisition and System Management
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DCGS-A	Distributed Common Ground System-Army
DfR	Design for Reliability
DMBSE	Decision Model Based Systems Engineering
DoDAF	DoD Architecture Framework

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Acronym	Definition
DOORS	Dynamic Object-Oriented Requirements System
DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel and facilities
DP	Development Planning
DPWG	Development Planning Working Group
DR	Data Rights
DTRA	Defense Threat Reduction Agency
ECBC	Edgewood Chemical Biological Center
ECP	Engineering Change Proposal
EHAA	Expedited Hiring Authority for Acquisition
EMD	Engineering and Manufacturing Development
ENG	Engineering
ERS	Engineered Resilient Systems
ESG	Executive Steering Group
EW	Electronic Warfare
FACE	Future Airborne Capability Environment
FBA	Force Basing Architecture
FD	Feeder Data
FoCBA	Family of Concealable Body Armor
FSC2	Fire Support Command and Control
FSS	Force Sustainment Systems
FTL	Functional Technology Lead
FW	Fixed Wing
FWS	Family of Weapons Sights
FY	Fiscal Year
GCV	Ground Combat Vehicle
GEOINT	Geospatial Intelligence
GFE	Government Furnished Equipment
GMLRS	Guided Multiple Launch Rocket System
GOSC	General Officer Steering Committee (or Council)
GOTS	Government off-the-shelf
GS&CC	Governance, Synchronization and Configuration Control
GSARC	Ground System Advanced Reliability Capability
HALT	Highly Accelerated Life Testing
HBSS	Host Based Security System
HMMWV	High mobility multi-purpose wheeled vehicle
HMS	Handheld, Manpack, and Small Form Fits
HQ	Headquarters
HQDA	Headquarter, Department of the Army
HTV	Heavy Tactical Vehicles
HW	Hardware
IA	Information Assurance

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Acronym	Definition
IAMD	Integrated Air and Missile Defense
IAMDSIM	Integrated Air and Missile Defense Simulation
IBA	Interceptor Body Armor
IBCT	Infantry Brigade Combat Teams
IBD	Integrated Base Defense
ICD	Initial Capabilities Document
IEW&S	Intelligence, Electronic Warfare and Sensors
IFPC	Indirect Fire Protection Capability
IGCE	Independent Government Cost Estimates
IMS	Integrated Master Schedule
IPT	Integrated Product Team
IRF	Integrated Requirements Framework
IS	Information Systems
ISF	IAMD Simulation Framework
IT	Information Technology
ITEP	Improved Turbine Engine Program
ITNE	Integrated Tactical Networking Environment
ITS	Integrated Tactical Systems
JCIDS	Joint Capabilities Integration and Development Systems
JIIM	Joint, Interagency, Intergovernmental, and Multinational
JLTV	Joint Light Tactical Vehicles
JNE	Joint Network Emulation
JPEO CBD	Joint Program Executive Office Chemical and Biological Defense
JPM	Joint Program Manager
JSTO	Joint Science and Technology Officer
JTN	Joint Tactical Network
JTR	Joint Tactical Radio
JWARN	Joint Warning and Reporting Network
KE	Knowledge Environment
KLP	Key Leadership Positions
KPD&M	Key Parameter Development and Management
KPP	key performance parameters
KSA	key system attributes
LAMPS	Large Advanced Mobile Power Sources
LBRR	Lab-based Risk Reduction
LMP	Logistics Modernization Program
LTV	Light Tactical Vehicles
LUT	Limited User Test
LWN	LandWarNet
M&A	Measurement and Analysis
M&S	Modeling and Simulation
MBSE	Model-Based Systems Engineering

Acronym	Definition
MC	Mission Command
MDAP	Major Defense Acquisition Programs
MDD	Materiel Development Decision
MDEP	Management decision package
MEARS	Multi-User ECP Automated Review System
MEHPS	Mobile Electric Hybrid Power Sources
MEP	Mobile Electric Power
MOA	Memorandum of Agreement
MPS	Major Program Support
MRAP	Mine Resistant Ambush Protected
MS	Milestone
MSA	Materiel Solution Analysis
MSE	Missile Segment Enhancement
MTV	Medium Tactical Vehicle
NCR	National Capital Region
NCS	Network Capability Set
NDAA	National Defense Authorization Act
NDB	Network Design Book
NDI	Non-Developmental Item
NetOps	Network Operations
NGA	National Geospatial-Intelligence Agency
NIE	Network Integration Exercises
N-SE	Non-Standard Equipment
NSG	National System for Geospatial-Intelligence
NSN	National Stock Numbers
NSRDEC	Natick Soldier Research, Development and Engineering Center
NVESD	Night Vision and Electronics Sensors Directorate
O&S	Operations and support
OA	Operational Architecture
OCSE	Office of the Chief Systems Engineer
OMS/MP	Operational Mode Summary/Mission Profile
OSA	Open System Architecture
OSD	Office of the Secretary of Defense
PAC-3	Patriot Advanced Capability-3
PAWS	Petroleum and Water Systems
PBL	Performance Based Logistics
PD	Product Director
PDM	Product Data Management
PdM	Product Manager
PEO	Program Executive Office
PEO Ammo	PEO for Ammunition
PEO M&S	PEO Missiles and Space

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Acronym	Definition
PEWG	Product Data and Engineering Working Group
PfM	Portfolio Management
PIA	Platform Integration & Analysis
PIM	Paladin Integrated Management
PIP	Platform Integration Plan
PM	Program Manager
PMO	Program Management Office
POM	program objective memorandum
PS	Power Steering
PWS	Performance Work Statement
R&D	Research and Development
R&M	Reliability and Maintainability
RA	Reference Architecture
RAM&S	Reliability, Availability, Maintainability, and Sustainability
RAM-C	Reliability, Availability, and Maintainability-Cost
RDEC	Research, Development and Engineering Centers
RDECOM	Research, Development, and Engineering Command
RDS	Radiological Detection System
RIF	reduction in forces
RIWG	Reliability Improvement Working Group
RMP	Risk Management Plan
RMWG	Reliability & Maintainability Working Group
RSWG	Reliability Systemic Working Group
RTM	requirements traceability matrix
RTSCE	Real Time Safety Critical Embedded
S&T	Science and Technology
SBCT	Stryker Brigade Combat Teams
SCIE	Soldier Clothing and Individual Equipment
SE	Systems Engineering
SE2T	Specialty Engineering Education and Training
SECDEF	Secretary of Defense
SEGB	Systems Engineering Governance Board
SEP	System Engineering Plan
SERC	Systems Engineering Research Center
SICE	Service and Infrastructure Core Enterprise
SKOT	Sets Kits Outfits and Tools
SLWG	Service Lead Working Group
SMBL	System Migration Binning List
SME	Subject Matter Expert
SMP	Synchronization Modernization Process
SOP	Standard Operating Procedure
SoS	System of Systems

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Acronym	Definition
SoSE	System of Systems Engineering
SoSE&I	System of Systems Engineering and Integration
SoSEMP	System of Systems Engineering Management Plan
SoSI	System of Systems Integration
SPE	Soldier Protective Equipment
SPIE	Soldier Protection and Individual Equipment
SPRDE	System Planning, Research, Development, and Engineering
SPS	Soldier Protection Systems
SSL	Soldier, Sensors and Lasers
STRI	Simulation, Training and Instrumentation
SV	System Views
SW	Software
SWaP-C	Size, Weight and Power-Cost
T&E	Test and Evaluation
TAB	Technical Advisory Board
TARDEC	Tank and Automotive Research, Development, and Engineering Center
TD	Technology Development
TEMP	Test and Evaluation Master Plan
TL	Team Leader
TMDE	Test, Measurement, and Diagnostic Equipment
TRADOC	Training and Doctrine Command
UHPO	Utility Helicopters Project Office
USACE	United States Army Corps of Engineers
USMC	United States Marine Corps
VE	Value Engineering
VEMS	Value Engineering Management System
VICTORY	Vehicular Integration for C4ISR/EW Interoperability
WFF	Warfighting Functions
WIN-T	Warfighter Information Network -Tactical
WSARA	Weapon Systems Acquisition Reform Act
WSTA	Whole System Trade Analysis

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APPENDIX B

Department of the Navy
Systems Engineering Self-Assessment

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DEPARTMENT OF NAVY

Systems Engineering
FY13 Annual Self-Assessment Report

12 December 2013

Prepared by the Office of the Assistant Secretary of the Navy

(Research, Development and Acquisition)

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EXECUTIVE SUMMARY

The Department of Defense Deputy Assistant Director for Systems Engineering (DASD (SE)) is required to submit an annual report to Congress on the activities pursuant to subsections (a) and (b) of Public law 111-23 section 139. DASD (SE) tasked ASN (RDA) to develop the naval Systems Engineering (SE) portion of this annual report. This document responds to the DASD (SE) request.

Specifically, this report identifies progress made and plans for improved SE capability to include: (1) Service-Level (Department of the Navy (DON)) SE Strategy; (2) Pre-Milestone (MS) A and Pre-MS B rigorous systems analysis and SE process; (3) reliability, availability, maintainability, and sustainability as an integral part of design and development; (4) SE requirements during the Joint Capabilities Integration and Development System (JCIDS) process and in contract for each Major Defense Acquisition Program (MDAP); (5) provision of evidence of progress against the FY13 areas for improvement identified in the FY12 self-assessment; and (6) identification of plans for addressing FY14 priority areas to improve SE and development planning capability of the DON.

Additionally, this report assesses the SE workforce to include: (1) a listing of workforce development initiatives where progress has been made in FY13 and plans for improvement in FY14, (2) identification of additional authorities or resources needed to meet the experience and technical expertise of SE in DON, and (3) a complete listing of Systems Planning, Research Development and Engineering (SPRDE)-coded (as of FY14: ENG) military and government personnel.

1.0 Progress and Plans for Improved Service Systems Engineering Capability

1.1 Service-Level Systems Engineering Strategy

The strategy to increase naval Systems Engineering (SE) capability focuses on the integration and standardization of SE processes to enhance mission effectiveness and reduce SE costs, thereby improving mission assurance (MA), reliability and maintainability (R&M), agility, and interoperability of System of Systems (SoS). All efforts to increase SE capability support four of ASN (RDA)'s Top Priorities:

1. Getting the requirements right
2. Making every dollar count
3. Performing to plan
4. Rebuilding the acquisition workforce

In late FY13, DASN (RDT&E) initiated a Systems Engineering Streamlining Initiative (SESI) to identify efficiencies in current SE processes without compromising sound technical, engineering and safety risk management strategies. This initiative will report out in FY14, and coupled with Better Buying Power 2.0 and DODI 5000.02, will set the course for out year System Engineering strategies.

1.1.1 Improving SE – Getting the Requirements Right

Standardization and Integration of SE Processes

Under direction of the Systems Engineering Stakeholders Group (SESG), the 2004 Naval Systems Engineering Guidebook (NSEG) is being revised to align with existing policy and guidance documents and SE tools currently in use by DoD SEs. Content development and process accomplishments to date include:

- Researched and documented 230 SE products
- Aligned technical products generated throughout SE life cycle
- Identified SE products for all 16 SETRs
- Linked source references for policies, guidance, templates
- Developed succinct product descriptions that focus reader on Naval SE implementation
- Employed the Naval Systems Engineering Resource Center (NSERC) for NSEG WG collaboration
- Online NSEG accessible to SESG for visibility, feedback, sharing draft files, and tracking action items.
- Engaged SMEs in iterative development:
  - SEs providing technical inputs and review of draft items
  - NSERC team supporting user interface design discussions

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In FY13, the SESG began a critical transformation of the NSEG, moving from a self-limiting printed format to an online interactive compendium that focused on providing a quick reference for users to facilitate development of products being developed for SETR events as the primary technical review points for SE activities. The NSERC team supported user interface design discussions. SharePoint designers have begun developing an interactive, web-based capability that leverages the design of the MS Document Identification tool sponsored by the Defense Acquisition University as well as existing SE policies and guidance across the Naval System Commands. As the NSEG revision team continues spiral development of content and online infrastructure in FY14, it will also expand to contain information on several different key SE activity categories, including:

- Integrating a SoS perspective on SE for platforms and mission areas
- Developing DoDAF architectures from a mission-level perspective
- Aligning system capabilities to mission areas
- Explaining to the SE workforce the value of developing these architectures as early in the acquisition cycle as possible so that they can be used to improve SE requirements during the Joint Capabilities Integration and Development System (JCIDS) process.

The NSEG will be the first online interactive SE guide for the Navy. The design and development team is working closely with the Defense Acquisition University (DAU) to ensure a compatible implementation so that the Navy NSEG links seamlessly within the DAU SE site.

The Navy established a Naval Deputy Standards Officer (NDEPSO) and the SESG Standards Working Group recommended re-establishing SE guidance provided in MIL-STD 499 and MIL-STD 1521. Acting on that recommendation, the Defense Standardization Council chartered the working group to engage non-governmental standards organizations to identify and adapt commercial standards, where applicable, to DoD processes.

In FY14, the SESG, a collaborative team of the Naval SYSCOM Chief Engineers and DASN (RDT&E), will be revising the following policies to incorporate lesson learned from integrating SE efforts across the SYSCOMs:

- Joint SYSCOM SE and Technical Authority (TA) Instruction
- Naval SYSCOM Risk Management (RM) Instruction
- Joint SYSCOM Standards Instruction

Information Dominance

SPAWAR has been designated the TA for Navy Information Technology (IT) Systems. Because they provide the medium for the transmission of information, IT systems form the foundation for achieving the capability of Information Dominance (ID). Navy ID is defined as the operational

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advantage gained from fully integrating the Navy's information capabilities, systems, and resources to optimize decision making and maximize warfighting effects in the complex maritime environment of the 21st century. The U.S. Navy ID Roadmap of March 2013, and publicly available, addresses near-term milestones for improving capabilities in three areas: (1) assured command and control (C2), (2) battle space awareness, and (3) integrated fires.

To implement the ID vision, SPAWAR continues to refine the Executable Architecture Requirements Model (EXARM), which provides a SoS analytic framework to support fact-based decisions to support a SoS life cycle. EXARM consists of four parts: people, processes, tools, and data. People are trained as mission engineers to define the architecture of a mission and use that architecture to support SE. Processes are developed to support SoS testing and certification. Tools provide the development of mission engineering architectures and their integration with requirements derivation and modeling and simulation. Data is configuration managed and authoritative, resulting in repeatable analysis and re-use of architecture models. SPAWAR continues to build the EXARM toolset and is collecting the architecture data needed to achieve an initial capability that will cover the Navy's highest priority mission areas and 80% of the systems in the ID SoS. The Navy is leveraging the initial capability to use EXARM to address naval information issues in 2014, including application to the naval approach to the Joint Information Environment (JIE).

In FY13, a 180-day study was completed by the SYSCOMs to define a process for managing the boundaries of IT TA. Because IT systems exist within a platform and external to a platform, it was necessary to refine the scope of SPAWAR's IT TA. CNO and ASN (RDA) approved the recommendations of the study and directed the SESG to develop a cross-systems command Information Technology/Information Assurance Technical Authority Board (IT/IA TAB) under the leadership of SPAWAR. This new board reflects the increased cross-SYSCOM interaction while adapting legacy systems and new technology to address emergent threats and challenges. The tasking includes the consolidation of network architecture authority under SPAWAR; development of certification criteria and a governance structure for coordinating and implementation; creation of certification standards through which existing systems and networks will be certified; the definition of the boundaries of IT TA across the SYSCOMs; and the definition of how IT TA applies to new acquisition, in-development, and legacy programs. All systems analysis and SE processes will be reviewed to ensure that IT/IA TA is considered throughout the development and deployment cycle. The IT/IA TAB will review, adjudicate, and endorse IT/IA technical policies, processes, and standards to include technical standards and specifications, interface definitions, architectures, and certifications requirements.

Mission Assurance

The IT/IA TAB will support MA by managing the IT specifications, standards, and profiles and ensuring that acquisition programs are using them and complying with them. Physical and logical interfaces between IT systems and weapon systems will be defined and configuration managed and the IT/IA TAB will approve deviations and waivers. A more holistic approach to cyber security will be developed, so that cyber risk can be addressed across a SoS, rather than system by system, and clear IA requirements can be provided to programs.

NAVSEA's focus for SE improvement includes MA, which integrates critical specialty engineering areas and SE technical risk management. Specifically, MA engineering integrates the several critical specialty engineering area constructs, including but not limited to, reliability, safety, environment, program protection, human systems integration (HSI), IA, maintainability, supportability, software usability, and interoperability. MA engineering works within the Integrated Planning Team effort and fosters robust risk identification, assessment, and analysis to implement the appropriate mitigations. MA engineering strategies support the chief/lead systems engineer in addressing the critical factors and related risk that affect and ensure mission performance of the system. In FY13, NAVSEA worked with DASN (RDT&E) to add software assurance to the Guidebook for Acquisition of Naval Software Reliant Systems, published on NSERC.

System of Systems

In FY13, the Navy consolidated SoS architecture processes into a single guidebook that harmonizes SoS engineering practices. The Naval System of Systems Guidebook aligns with the DoD System of System Guidebooks, the Defense Acquisition Guidebook (DAG) Chapter 4, and the Integrated Capability Framework Operational Concept Document.

Integration and Interoperability

The Naval SYSCOMS completed the development of Integration and Interoperability (I&I) SETR evaluation criteria and have started to implement the criteria in technical reviews. The Naval SETR Guidebook will be incrementally revised in FY14 and web links to the I&I SETR criteria will be added.

Open System Architecture

In FY13, the Naval Open Architecture Enterprise Team (NOAET) published an Open System Architecture (OSA) Strategy that unifies the myriad of open architecture strategies in DON. Additionally, the NOAET developed metrics to assess the institutionalization of OSA. An OSA Implementation Guidebook for Program Managers is under development.

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DASN (RDT&E) is working with naval and industrial organizations to establish a minimum set of OSA Technical Reference Standards (TRS). The Future Airborne Capability Environment (FACE) consortium has developed a Technical Standard (TS) for a Common Operating Environment to promote portability of software between different aviation architectures the re-use of software. The FACE TS defines the key interfaces for the operating system interface, the input/output interface, and the transport service interface. In FY13, the FACE TS was revised, a conformance policy with a verification matrix and test suite was developed, and a library administration plan and policy were developed. The Anti- Submarine Warfare Data Model is another TRS that has matured. This standard has been implemented in eight programs of record (POR), enabling platforms to share data more quickly and effectively.

SE Processes

Capability Acquisition Management (CAM): DASN (RDT&E) funded a cross-SYSCOM engineering team to investigate procedures that will assess the institutionalization of new SE processes into the mainstream SE efforts for programs of record. The team investigated methods to improve SE processes and evaluate the success of the improvements.

In FY13, the CAM team accomplished the following to improve SE processes:

- Developed entrance and exit criteria for SETRs that considers I&I of the systems in the SoS. This followed FY12's effort to develop SETR evaluation criteria for I&I. The evaluation criteria are being applied and refined as platform and mission area capability reviews are being conducted for element systems and SoS across the fleet.
- Developed process flow charts to be used prior to each SETR to assess the impact of a changing threat on the acquisition program life cycle.
- Defined a process to assess the cost of the improvement to mission operational effectiveness as a function of the cost of the system operational effectiveness improvement using a combination of a Cost as an Independent Variable process and a behavior hierarchy process.
- Created a method to capture metrics to assess how well the I&I evaluation criteria developed in FY12 have been institutionalized in the Navy acquisition programs.

Marine Corps Systems Command (MCSC) provided systems and software engineering representatives to several Naval SE forums, to include the SESG. Several working groups are chartered to deliver FY13 and beyond products, to include the Software Working Group, Software Community of Practice (CoP), and the Naval Systems Engineering Tools Working Group. MCSC contributions to several common Naval SYSCOM products include the NSEG and supporting policies.

Agility

MCSC continues an aggressive Agile software development process education and implementation activity, which has been successfully implemented by software-intensive programs. MCSC will continue to expand the Agile educational training program to build upon their early success and work with DAU to align SE processes with Agile processes.

Noise Protection and Abatement

The Hazardous Noise Working Group Co-Chaired by U.S. Navy Bureau of Medicine and Surgery (BUMED) and DASN (Safety) – Acquisition Safety has been concentrating on leveraging existing programs to improve acquisition and research programs. The Working Group is emphasizing acquisition strategies for low noise source components and systems. MIL-STD 1474E is undergoing final adjudication to update noise limit design criteria, calculation models, and limits of acceptable noise levels. As *ad hoc* members of the Defense Safety Oversight Council, the working group assisted in a study to calculate the return on investment for installing acoustical engineering controls on selected high noise sources within DoD. The information can be used on current platforms and in future acquisitions. A study was completed to determine hearing critical tasks in the military, which can be used in developing auditory fitness for duty standards and education and training programs. The Noise Induced Hearing Loss (NIHL) research program is designed to prevent hearing loss and tinnitus through better understanding of noise reduction techniques and technologies, improved personal protective equipment, educational tools, investigation of how sound waves cause hearing loss, and development of pharmacological interventions. The portfolio represents a comprehensive approach to solving a complex problem. New research is studying the effects of a 24-hour noise dose aboard ships, the role of hearing in situational awareness to improve warfighter performance, and the relationship between mishaps and hearing loss. This information is provided to the VCNO Noise Abatement Flag/SES board. The Office of Naval Research (ONR) NIHL Program (budget activities 6.1 - 6.3) provides the basic research to address engineering and medical issues.

1.1.2- Making Every Dollar Count – Supporting Better Buying Power (BBP)

The OHIO Replacement program (ORP) is a model for Secretary Kendall's BBP approach to defense acquisition, incorporating, from the start, key tenets such as affordability targets [goals] and innovative contracting. Since the program's initial acquisition milestone, PEO SUBS has focused on delivering a ship with the right capability at the lowest possible cost. The Research and Development (R&D) contract with Electric Boat includes discrete incentives for reaching significant, specific non-recurring engineering, construction, and operation and support costs. This is the first time a shipbuilding R&D contract has tied substantial incentive fees to cost reduction across the entire life cycle. PEO SUBS has aggressively reviewed the trade space in the design of the submarine to reduce costs in every system.1.2 Pre-Milestone A and Pre-Milestone B Rigorous System Analysis and SE Process.

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DASN (RDT&E), NAVSEA, NAVAIR, and ONR are actively participating in the DASD (SE) Development Planning Working Group (DPWG). FY13 efforts resulted in documentation of the process that integrates Science and Technology (S&T) efforts with acquisition efforts prior to a Materiel Development Decision (MDD).

In FY13, the Navy continued participation in the DAG revision to describe a process for adding rigorous SE analysis to Pre-MS A acquisition processes for consideration by the DAG team. This year, the Navy has accomplished the following in support of more rigorous SE:

- Shared lessons learned across the SYSCOMs on the early development of DoDAF products in support of Pre-MS A analysis at the May 2013 meeting of the SESG.
- Added process flow charts to the Naval System of Systems Engineering Guidebook (NSoSEG) to ensure development of a capability/mission-based technical baseline from MDD to MS A in support of developmental planning.
- Conducted Mission Level Assessments and Evaluations (MLA&E) to support acquisition decisions by defining and making traceable SoS interdependencies, defining the Government trade space to be worked, and aligning material solution(s) with the required doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) changes.
- Added guidance for a rigorous system analysis approach for Pre-MS A to the NSoSEG
- Re-organization has partially occurred at SPAWAR and NAVAIR to create organizational entities that specifically support SoS Engineering to provide rigorous system analysis prior to MS A and MS B. More detail is provided in Section 1.5 of this document.

The MCSC, working with the requirements community, has established a SE capability to provide engineering and cost-informed requirements decisions to support JCIDS documentation development for Pre-MS A and throughout a program's life cycle. Numerous engineering-cost analyses have been conducted using SE methods and tools, enabling the requirements community to make informed decisions, reduce program risk, accelerate program fielding, and minimize cost.

MCSC, Deputy Commander, Systems Engineering, Interoperability, Architectures, and Technology (DC SIAT) supported Pre-MS A and B SE by providing liaison representatives to the Marine Corps Combat Development and Integration (CD&I) requirements community to better understand the requirements generation process and support requirements transition to the material developer at MCSC. Through an assigned requirements transition lead, additional engineering studies were performed to analyze alternatives and evaluate the results through Alternative Systems Reviews leading to rigorous SETRs and repeatable processes.

NAVSEA is currently updating, and improving NAVSEA SE, RM, and TA policy, guidance, and procedures to support more rigorous SE prior to MS A. Updates to the SETR checklist for several critical specialty engineering areas and SETR process re-structuring are published on the NSERC site for easy access by programs and TAs. NAVSEA TAs are identified on NSERC to promote cross-SYSCOM identification of appropriate TA for review of NAVAIR, SPAWAR, MCSC, and NAVFAC SEPs. In FY14, the NSoSEG will be delivered and made available for planning and execution by Naval acquisition programs to 1) ensure development of a capability/mission-based technical baseline from MDD to MS A in support of developmental planning, and 2) to provide rigorous system analysis prior to MS A and MS B.

1.2 Reliability and Maintainability Engineering As an Integral Part of Design and Development

In FY 13, the Navy continued to develop and evolve processes to implement USD (AT&L)'s Directive Type Memorandum (DTM) *Reliability Analysis, Planning, Tracking, and Reporting.* R&M Engineering planning is summarized in the SEP document that is required by SECNAV Instruction for all ACAT levels. New programs are working to a process that is tailorable at the lower ACAT levels, depending on the platform. Programs with a Program Acquisition Resource Manager (PARM) relationship may be addressed within their platform R&M planning and reporting when they are part of a large system of systems. Programs that have been underway for years, possibly more than a decade, continue to struggle with expectations of R&M engineering activity that was not required prior to issuance of the DTM 11-03. All of the naval SYSCOMS are working to improve their R&M engineering effectiveness; some are further along than others. Each has different challenges based on their product areas and workforce skills and the extent to which they implemented previous acquisition reforms that transferred the responsibility for R&M Engineering to the contractor.

DASN (RDT&E) R&M Engineering staff work with the SYSCOMS and their individual programs in order to accelerate their learning curve and increase the effectiveness of their effort. Current examples include; the rollout of the Defense Acquisition Executive Summary (DAES) reliability growth reporting that required individual assistance to meet the due dates; and DAB preparations that required the coordination of varied program and project offices to present platform level R&M engineering planning and an effectively articulated T&E strategy.

Department-wide activity continues through the DON R&M Leads working group. Each SYSCOM then has a SYSCOM level working group to tailor and implement the DoD and DON policies. Progress has been made in several areas that improve the Department-wide capability to implement effective R&M engineering; an R&M appendix is being prepared for the NSEG; several legacy courses that had not been used for years were updated to today's references, requirements and toolsets have been updated and many sessions of the courses have been delivered with notable success. There are also efforts to codify implementing procedures at one

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SYSCOM which are shared across the DON for adaptation at other SYSCOMS. Cross functional cooperation is also increasing to the mutual benefit of the programs and the workforce. One SYSCOM has a cross-functional IPT to improve operation and maintenance of military systems with managed risk with the enabler being improved equipment R&M.

SPAWAR has a unique challenge resulting from much of their work being the development of systems through integrating hardware that is already designed, where the DoD prescribed R&M engineering activities and processes are focused on the design effort. While SPAWAR struggles with influencing design early in the acquisition process through actual design or by selection of existing hardware, they should increase their effort on implementing an effective failure reporting, analysis, and corrective action system (FRACAS) process. This may be a combined engineering and sustainment cross-functional effort. FY14, DASN (RDT&E) R&M will work with SPAWAR R&M engineering to implement an effective Command level FRACAS process at SPAWAR, beginning with early engineering development and integration efforts, and continuing throughout the life cycle.

1.3 SE Requirements During the JCIDS Process

In FY13, the Navy continued to support development planning processes so that the right requirements are defined as early as possible in the JCIDS process. The Navy supported the efforts of the DASD (SE) DPWG to incorporate S&T and the Warfighter into the SE processes that occur prior to the MDD.

The Navy revised the Navy Marine Corp Acquisition Regulation Supplement (NMCARS), subpart 5207.105, to state that contracting officers shall incorporate the requirements of developing draft engineering and logistics planning documents in their acquisition planning for ACAT I, IA, II, III, and IV programs prior to Request for Proposal (RFP) release. NMCARS now fully implements the Principal Deputy Undersecretary for Defense, Acquisition, Technology, and Logistics (AT&L) (PDUSD (AT&L)) memorandum, Improving Milestone Process Effectiveness, dated June 23, 2011.

MCSC has established Milestone Assessment Team (MAT) reviews of the programmatic and technical health of programs. These reviews are aligned with the Naval Gate Reviews and JCIDS. The gates have entrance and exit criteria that must be met before programs can progress to the next gate, key acquisition event, and/or MS. During Pre-MAT meetings the Program Offices plan of action and MS (POA&Ms) to include JCIDS events, are reviewed by Engineering Competency personnel to ensure SE requirements are met before the program continues to the next MS Gate Review.

MCSC initiated the Determination Meeting Process (DMP) to evaluate all programs for statutory and regulatory SE requirements. In the DMP, the Engineering Competency discusses the possible tailoring of SE requirements, to include the review of JCIDS documentation so the

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PMOs are able to better prepare an accurate POA&M and Acquisition Strategy. The DMPs are conducted prior to MAT reviews to verify that entrance and exit criteria will be met.

Additionally, MCSC has established a Requirements Transition Team (RTT) to coordinate with Headquarters, Marine Corps in the development of requirements. The RTT is tasked with certifying that only valid capability statements or requirements documents are accepted by MCSC for action. The RTT is also the coordinator for matters associated with building the Marine Corps Enterprise Integration Plan (MCEIP), which establishes capabilities-based priorities for each fiscal year and coordinates enterprise capability development and investment planning for the Marine Air Ground Task Force (MAGTF) and supporting establishment. The RTT works closely with the requirements and test community and then integrates appropriate MCSC engineering analysis and support prior to delivery of the final requirements.

NAVSEA's Naval Ordnance Safety and Security Activity (NOSSA) actively monitors JCIDS documentation in support of both the Deputy Director for Force Protection, Joint Staff (J8) and OPNAV N81 for review to ensure that the capabilities outlined in the documentation meet the Joint warfighting environments in which weapon systems are expected to operate. As has been recognized over the last two major conflicts in Afghanistan and Iraq, weapon systems are being used by multiple Services and the environments in which they are evaluated need to be inclusive of the environments to which they are exposed, such as the Navy electromagnetic environments for Army lead items. From a system safety perspective, NOSSA comments are being provided to ensure that system capabilities can be executed safely across life cycle operations. NOSSA has also been providing JCIDS document comments for I&I safety to ensure that capabilities to avoid fratricide are included and that the integrity of data transfers within an SoS context are considered.

1.4 Service-Specific Identified Area(s) of Progress and Improvement

Marine Corps Systems Command (MARCORSYSCOM)

In an effort to better inform the requirements and acquisition communities, MCSC has developed the Framework for Assessing Cost and Technology (FACT) tool. This set of integrated decision support tools, used by acquisition teams, evaluates total system life cycle and assesses designs against performance, cost, RM&A, and schedule. FACT will continue to be matured to facilitate Modeling and Simulation (M&S) in support of SE, enabling rapid trade space and alternatives analysis for Marine Corps programs throughout the acquisition life cycle.

MARCORSYSCOM Deputy Commander, Systems Engineering, Interoperability, Architecture, and Technology (DC, SIAT) provided liaison representative(s) to the CD&I Requirements Community to better understand the requirements generation process and support requirements transition to the material developer at MCSC. Additional engineering studies are performed to

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analyze solution alternatives and evaluate the results. Future efforts include the development of M&S capabilities to analyze requirements for feasibility and eventual trade studies.

The MAGTF Analysis War Rooms provide leadership and management direction to analyze both capability requirements and the functions provided by programs/systems at the individual level and the larger SoS levels. The SE and requirements community collaborate to trace war fighting operational capabilities to individual system functions. This effort, which began in FY12, is in the process of evaluating the Command and Control functions and has addressed a number of other critical areas to support the requirements and investment efforts.

The MARCORSYCSCOM Technical Area Expert (TAE) List is updated annually to provide Marine Corps programs' lead engineers the ability to quickly identify the specific qualified resources to support their needs. This list provides a common directory of available government expertise within DoD that can be sourced to meet the engineering needs of the Marine Corps. Resources identified in the list include the Space and Warfare System Centers (Atlantic and Pacific) and Naval Surface Warfare Centers' (NSWC) workforce, and other service technical experts for similar engineering and product support. MCSC continues to leverage NSWC expertise in an effort to strengthen the engineering workforce with the knowledge, skills, and abilities found in the naval laboratories organization. Specific efforts include NSWC workforce integration into the SETR process, many as engineering team members involved with all system development activities, while also reserving experienced NSWC TAs as independent reviewers for unbiased analysis.

MCSC has established a responsible organization for HSI within the SE Directorate. This organization also operates an on-base facility known as the Gruntworks Squad Integration Facility in order to conduct HSI of Marines with equipment worn, as well as integration of combat equipped Marines into vehicle and aircraft platforms. The HSI organization and programs within MCSC employ NSWC Dahlgren Division for additional HSI support as required. HSI planning and application is conducted within the PMOs across all seven domains of HSI. This effort treats the Marine and his equipment as a system and has significant SE capability to improve Marine infantry performance. Education, training, and knowledge of resources continue to be fundamental factors in SE documentation and procedures and are strengthened by MCSC personnel currently enrolled in HSI Masters and Certificate Programs with the Naval Postgraduate School (NPS).

NAVAIRSYSCOM

In FY13, NAVAIRSYSCOM formally stood up a dedicated Platform/Stores Integration (PSI) organization within the SE Department in order to address the increasing complexity of modern weapons and their interdependencies with other on- and off-board systems within the battle space. In addition, commonality across multiple type/model/series aircraft demands consistency, versatility, and clarity in the integration process. Failure to identify and document the integration

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requirements early in a platform or weapon acquisition life cycle has proven costly to correct. Successful platform/store integration programs are the result of clearly defined and agreed upon roles, responsibilities, and dependencies between the aircraft and weapon PEOs and their respective PMOs.

The PSI organization specifically addresses the integration of a platform's stores management equipment, operational flight programs, suspension equipment, stores, mission planning and weapon employment data, control stations, ground support equipment, training, and supporting publications necessary to meet operational requirements. The discipline of platform/stores integration uses established SE principles and processes to manage the trade space between the store and the aircraft and ensure that the operational requirements of both are met. By applying rigorous and disciplined practices to the development, modification, upgrade, and sustainment of platforms and weapons ensures that the safety, cost, schedule, and performance benchmarks of both will be met.

NAVAIR has created an Integrated Warfighting Capabilities (IWC) Enterprise Team (ET) to begin the implementation of I&I as an organizational element in the SYSCOM. The IWC ET is charged with the task of understanding mission-level requirements, in the context of system-level POR requirements. An improved mission-level understanding of systems integration design issues will facilitate the delivery of IWC at reduced cost.

The IWC ET contains the necessary SE, T&E, and Logistics competencies to execute TA at the mission level and will drive workforce requirements across the NAVAIR competency structure for mission-level engineering expertise. Mission-level expertise will be utilized at both the POR execution level of the organization and in support of requirements and resource decision making within the DON.

The SE functions of the ET focus on the necessary products used to govern the technical design of systems contributing to mission capabilities as called for in the Required Operational Capabilities / Projected Operational Environment (ROC/POE). The IWC ET will focus on the interaction of people, equipment, and training required to deliver both kinetic and non-kinetic effects.

The IWC ET is developing a set of products using the Integrated Capability Framework (ICF) process previously developed by the Naval SYSCOMs under DASN (RDT&E) sponsorship. These products will include Mission Technical Baselines (MTB) and Integrated Capability Technical Baselines (ICTB). MTBs and ICTBs will be used as both design guidance and system performance assessment materials for Mission Capability tasks. An MTB is authoritative source data that describes the threat and functional breakdown of activities required to meet a commander's objective in a mission area. The ICTB is the mapping of Blue (i.e., "friendly") system-specific performance data against functions required within an MTB for a given ROC/POE mission. The ICTB enables the identification and tracking of deficiencies and the

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verification of mission capabilities using authoritative data sources. The ICTB is the specific engineering activity that will result in improved design governance at the individual system level, based on mission criteria. Work performed within the ICF construct will be reported using tools compliant with the DoD Architecture Framework (DoDAF 2.0) as well as requirements management tools commonly found in the NSERC.

SE improvement activities at NAVAIR are concentrated in the area of SE Transformation (SET) with specific focus on Model-Based SE (MBSE). SET supports ASN (RDA)'s top priority of making every dollar count by aiming to reduce the acquisition timeline by approximately 25%. NAVAIR established the Systems Engineering Development & Implementation Center (SEDIC) in 2009 to provide a focused resource for SE improvement within NAVAIR programs. To date, the SEDIC has completed and released menu-driven SETR checklists, deployed the Checklist Manager (CLM) toolset, and developed guidance documentation for Pre-MS A activities associated with Materiel Solution Analysis (MSA). The SEDIC is in the process of updating the NAVAIR SETR instruction, SE Web-based toolsets, and associated training. The updated SETR instruction will provide improved SETR guidance and will be supplemented with a new NAVAIR SETR Process Handbook. Additionally, the SEDIC activities for the next year will focused on SET in the area of MBSE.

The SEDIC SET activities include creating an integrated digital environment to enhance efficiency of SE application and serve as a platform for MBSE transition. The SEDIC is participating in the characterization of the current state of MBSE application within Government and the aerospace industry. The MBSE characterization will include assessment of models, MBSE process, methods, tools, policy, and infrastructure; all aimed at assessing current modeling baseline and associated gaps to determine overall feasibility of transformation.

SPAWARSYSCOM

As part of executing the IT/IA TA role in FY14, SPAWAR will continue to examine development of Technical Warrant Holders (TWH) in light of emergent technologies and new product lines related to IT and IA, as well as its existing C4I, Enterprise Information Systems, and Space Systems areas of SE development.

SPAWAR has started reorganizing to support SoS Engineering. SPAWAR 5.0 (Office of the Chief Engineer) has been restructured to create a centralized engineering organization. One of the principal changes made to the SPAWAR 5.0 organization is the elevation of the Competency's Senior Executive Service (SES) leadership from the System Centers to a Headquarter function. Three Directorates have been formed to support SoS Engineering:

- Mission Architecture & SE Directorate will define the SoS design, develop mission architectures, and engineer future capabilities.

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- Mission Engineering Directorate will implement and execute the SoS design for new and upgraded systems.
- Certification & Mission Assurance Directorate will verify and certify the SoS design.

NAVSEASYSCOM

TA underpins the technical risk management effort on NAVSEA programs. TAs, specifically Ship Design Managers and Systems Integration Managers, directly support programs to ensure that the program SEPs articulate the SE analyses and reviews and ensure that these analyses and reviews are set into place across design development, thus helping the PM to manage costs and deliver best value systems and platforms to the Fleet. NAVSEA TAs manage SE efforts by:

- Overseeing core engineering and technical processes required to support the acquisition, in-service support, and disposal of platforms
- Operating and sustaining the research and SE competency needed to acquire, field, and support weapon systems and commodities
- Establishing standard policies, guidance, certification processes, technical specifications, and other engineering analyses and SETRs
- Rapidly and consistently incorporating advanced technology and lessons learned
- Supporting program IPTs
- Identifying technical risks and proposing mitigation and management strategies for PM consideration and implementation

NAVSEA's approach to the revitalization of SE and engineering excellence is managed by the NAVSEA CHENG (NAVSEA 05). The Research and Systems Engineering (R&SE) competency is part of the NAVSEA Competency Aligned Organization, led by the NAVSEA CHENG. TAs have the authority, responsibility, and accountability to establish, monitor, and approve TSs, tools, and processes in conformance and compliance with applicable DoD and DON policy, requirements, architectures, and standards per SECNAVINST 5400.15. They further have the responsibility to support programs in the assurance that the safety, reliability, usability, survivability, supportability, and performance aspects of Navy products are fully considered and technically evaluated and that NAVSEA products meet operational requirements.

To support ASN (RDA)'s top priority of getting the requirements right, NAVSEA has built strong engineering CoPs and infrastructure working groups across the R&SE competency, to include T&E, R&M, R&SE, and HSI working groups. The T&E competency, an SE enabler, will support acquisition and in-service TA through integrated T&E planning with an emphasis on enterprise T&E solutions across NAVSEA Headquarters, PEOs, and Warfare Center Division T&E activities, facilitating development of affordable T&E strategies.

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NAVSEA is supporting system safety and acquisition safety leads at OSD, ASN, and the Naval Safety Center level to establish clear linkage for system safety risk analyses and review processes for SE. This effort includes participation in joint service teams to improve standards for system safety, configuration management, SE, and noise limit design criteria. This collaboration between SE policy leads and safety leads ensures that system safety risk is identified early, and throughout the system design and development. NAVSEA is also working closely with NAVAIR, SPAWAR, MARCORSYCOM, and NAVFAC SE and System Safety policy leads.

NAVSEA SEs actively participated in the OSD AT&L rewrite of the Defense Acquisition Guide (DAG) Chapters: CH. 3 -- Affordability and Life-Cycle.; CH. 4 -- Systems Engineering, CH. 5 -- Life-Cycle Logistics; CH. 6 -- Human Systems Integration (HSI); CH. 9 -- Test and Evaluation (T&E) and are supporting the DASD(SE) DPWG and the Defense Standards Working Groups.

1.4.1 Status of FY13 Planned Areas for Improvement Actions

- **Planned Action:** Consolidate SoS architecture processes into a single guidebook that standardizes SoS engineering.
  Status: The NSoSEG has been revised as the single authoritative source of SoS processes. The revised guidebook will be issued in FY14.

- **Planned Action:** Continue to provide an operational perspective to the derivation of system performance requirements to allow the Navy to obtain the right requirements.
  Status: The Navy has incorporated pre-MDD and pre-MS A development planning processes into the NSoSEG. SPAWAR is developing the EXARM process described in section 1.1.2 of this report. The process is still under development and lessons learned will be available in FY14. Wider incorporation of the EXARM process and lessons learned will be incorporated into FY15 Naval guidance.

- **Planned Action**: Define and make traceable SoS interdependencies, define Government trade space to be worked, and align material solution(s) with DOTMLPF changes required.
  Status: The Navy has used the MLA&E process to define trade space and trace SoS interdependencies.

- **Planned Action:** Draft guidance and policy needed to execute the rigorous system analysis approach for Pre-MS A.
  Status: Guidance for the rigorous system analysis to support MS A has been written in the NSoSEG and in the ICF OCD.

- **Planned Action:** Create organizational entities that specifically support Mission Engineering/SoS Engineering.

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Status: SPAWAR and NAVAIR continue reorganizing to support Mission Engineering/SoS Engineering.

2.0 Systems Engineering Workforce

2.1 Workforce Development Initiatives – Rebuilding the Acquisition Workforce

In support of ASN (RDA)'s number five 'Top Priority' of rebuilding the acquisition workforce, the DON workforce development strategy continued to be centered on training, education, and certification in FY13. DASN (RDT&E) conducts yearly leadership development for the SE workforce through the Executive Leadership Development Program (ELDP) and also selects senior engineers to attend a 9-month Fellowship for a program sponsored by the MITRE Corporation.

DON continues to develop SE training tailored to specific domains and product areas to improve knowledge, skills, and abilities (KSA) of workforce members using specific SE concepts and processes. For example, NAVAIRSYSCOM Research and Engineering Group (AIR-4.0), SE Department (AIR-4.1), Mission Engineering & Interoperability Division (AIR-4.1.18) has developed courseware for two architecture development courses in the AIR-4.1 Mobile Training Environment (MTE) to conduct the training to develop the workforce and improve this core capability area. One course is for IBM Rational System Architect (SA) and one for IBM Rational Software Architect (RSA). SA is used on legacy systems for a structured Integration Definition (IDEF) method and RSA is used on new start programs for an Object Oriented Universal Modeling Language (UML) method in a MBSE approach. The architecture design training uses NSERC resources to support the SE architecture development process and assist PORs with meeting their interoperability requirements and technical compliance. This also supports Naval Enterprise Capabilities by translating operational requirements into system performance requirements using architecture tools in the SE process for compliance with DoDAF 2.0, CJCSI 6212.01F and JCIDS directive CJCSI 3170.01E.

As TA for interoperability and the DoDAF products, AIR-4.1.18 will provide a common approach to standardize the methods and tools and the ability to develop accurate and cost effective DoDAF architecture products for capability assessment and design of weapon systems. The resultant effort will enhance the conventional SE process with a new technological model-based method and tools to meet system design in a more automated, accurate, and cost effective manner, thereby streamlining the system development process and reducing technical process and document generation timelines. Technical documents include system specifications, contract data requirements, JCIDS documents, and the Information Support Plan to ensure that the solution architecture in the mandatory Net Ready Key Performance Parameter complies with the weapon system interoperability requirements and provides capability gap analysis. The core

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technical skills developed by this effort can be expanded for use by the entire system technical development and analysis process, thereby allowing this process to be used across multiple divisions and competencies consistent with the most recent I&I initiative that establishes a multi-disciplined IWC ET. The IWC ET will greatly benefit from the process and tools provided by this effort, honing critical technical skills across system development, analysis, and testing to provide the correct warfighter capability in all mission areas.

NAVSEA has developed and implemented a comprehensive TA curriculum to supplement DAWIA SE training for technical authorities. The training has been developed at four levels, Senior Level; Introduction to TA; Familiarization for TAs; and Deep Dive training for both in-classroom and online training. Program risk and technical risk negotiations and interface between PAs and TAs are being taught using hands-on case studies from real-world NAVSEA and Naval program efforts.

In FY13, the NAVSEA R&SE competency funded several training initiatives using the National Defense Authorization Act of 2008, Section 852, Acquisition Workforce Funding, and Warfare Center, and National Defense Authorization Act of 2009, section 219 funding to include: NAVSEA TA Training Initiatives; Marine Architecture; Anti-Tamper; Reliability Growth Management; Application of Reliability Growth Models in Developmental Test and fielded systems; Cost Engineering, RM; Cost and Schedule; SE Overview; Project Management for Engineers; Design of Experiments; T&E; and M&S Fundamentals and Principals.

DON workforce development includes many employees taking college-level classes toward degrees at various colleges and universities, including NPS. Among the graduate-level educational opportunities available to DON technical workforce is a Master of Science in Systems Engineering (MSSE) program, from NPS, which is designed to prepare graduates to meet technical challenges by giving them the education needed to design, build, operate, maintain, and improve reliable, capable, effective, and affordable complex SoSs. This program is considered the model for investing the DoD workforce revitalization funds. DON also accommodates the development of employees that want to take graduate-level courses without pursuing a graduate degree by offering graduate-level courses to acquisition workforce members. For example, in FY13, NAVAIR offered the NPS Fundamentals of SE graduate-level course to selected members of their acquisition workforce.

NPS, with active participation of DON SYSCOMs, has developed various certificate curricula that are available to the DON workforce. In FY13, NPS, in partnership with NAVAIR, developed a Lead Systems Integrator (LSI) certificate. This 4-course curriculum was designed to provide graduate-level courses to prepare engineers to assume positions as LSIs through the exploration of design and trade-off analyses of mission area and SoS architectures, the execution of SoS acquisitions, and engineering implications to the role of the LSI in contract management.

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DON workforce development includes hiring the required expertise and participating in the Navy Acquisition Intern Program (NAIP) and the Science, Mathematics and Research for Transformation (SMART) program. In FY14, DON will become the DoD Executive Agent for the SMART Program. NAIP and SMART Program candidates routinely transition to DON positions to perform SE for acquisition, RDT&E, and system support. In FY13, DON participated in the Pathways programs, which replaced earlier student programs for recruiting and hiring students and recent graduates. DON will continue to participate in the NAIP, SMART, and Pathways programs in FY14. In addition, DON offers rotational assignments and career broadening assignments to current employees.

In FY13, DON continued to be engaged in outreach and education initiatives in the areas of Science, Technology, Engineering, and Mathematics (STEM) in grades K-12 aimed at strengthening its future STEM talent pool.

The DAWIA SPRDE Program System Engineer (PSE) career field was discontinued in FY13. This field was intended for DON acquisition professionals, candidates or incumbent, GS 14/15 - 05/06 or senior, seeking a career as a Program Lead Systems Engineer. In addition, the acquisition workforce career field SPRDE was consolidated and renamed "Engineering" (ENG).

The Naval Systems Engineering Competency Career Model (SECCM) is part of the DASN (RDT&E) strategic initiative entitled the "Initial Development of Systems Engineering Competency Model" under the Task Title of the SE Competency Career Model Development (SEECMD) and Survey Tool. The population for the model is SE in the Navy and Marine Corps, and is not limited to the ENG career field. The ENG career field has been studied in conjunction with this SECCMD. The competency model was initially derived from various existing competency models in both government and industry.

The initial iteration of the SECCM was completed in FY13 and includes almost 3,000 individual KSAs, three notional career development levels, and 31 SE competencies–29 of which match the current DAU SE Competency Model. The two additional new competencies were identified as "30.0 Systems Thinking" and "31.0 Interpersonal and Personal Characteristics". All KSAs were mapped to the 31 competencies, education and training requirements, on the job training, and professional development.

Additionally, a total of 654 Course Learning (CL)/Performance Objectives (PO) and Enabling Learning Objects (ELO) for seven DAU ENG-SE Level III required courses were identified and added to the model. These CL/POs and ELOs were redefined as KSAs and were mapped to competencies in the model and to the Bloom's taxonomy levels.

Because this model was envisioned to focus on the specific competencies that define SEs on a primarily technical and program management basis, the set of competencies that reflect more generic engineering professional skills are partitioned out of this core model and are placed in a

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separate professional version of the competency model. Table 1 presents a complete list of education and training requirements by experience levels mapped to KSAs completed in FY13. In FY14, the SECCM will be validated through the Office of Personnel Management (OPM) uniform guidelines.

Table 1. Naval SE Competency Descriptions and Education and Training Requirements by Experience Levels

SE Experience Level	Definition	Work Experience	Education and Training (E&T)	On the Job Training (OJT)	Professional Development (PD)
			# KSA	# KSA	# KSA
SE-1 Entry Level	Able to understand the key issues and their implications. They are able to ask relevant and constructive questions on the subject. This level requires an understanding of the SE role within the enterprise.	0-3 years of work experience	253	222	221
SE-2 Journey Level	Displays an understanding of the subject but may require minimal guidance and with proper training and opportunity will be able to provide guidance and advice to others.	3-10 years of work experience	294	528	112
SE-3 Expert Level	Contains extensive and substantial practical experience and applied knowledge of the subject.	10-12+ years of work experience	58	417	185

SPAWAR has initiated the SECCM process to align KSAs at various levels at its Warfare Centers, while providing feedback to the authors. The goal is to better identify the KSAs for

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Naval SEs among the numerous jobs, roles, and activities conducted by the smallest programs to the largest platforms and at the warfare centers and at headquarters to improve the information in the SECCM. SPAWAR has created a renewed focus on training to improve mission area support by its SEs which will include keeping the KSAs of TWH current and relevant as the SECCM is updated and validated through the OPM uniform guidelines. In FY14, it is expected that all other SYSCOMs will engage in the same feedback process that SPAWAR has supported for the SECCM.

2.2 SE Workforce Resourcing

The President's budget is sufficient to support planned programs. SE becomes more critical in a fiscally constrained environment. As systems engineers with over 30 years of experience retire, they are often replaced with systems engineers with less than 10 years of experience. This loss of experience and the growing inability to hire the next generation of SEs inhibits the ability of SYSCOMs to maintain and sustain an experienced SE workforce. To work through these challenges in support of programs, SYSCOMS are streamlining processes and relationships and mentoring younger SEs. Support from Congress to continue intern and associate programs to keep the pipeline of younger SEs primed is crucial to workforce resourcing.

DON continues to work collaboratively with OSD to develop Common Cross Functional Key Leadership Position (KLP) requirements. Definitions for specific KLP requirements defining attributes and demonstrated experience beyond Level III were developed in FY13 based on the OPM-established leadership competencies. DON is actively participating in the OSD-led Tiger Team that concentrates on the design, development, and implementation of the KLP Qualification Board project that will be implemented in FY14 to qualify personnel to fill mandatory KLPs in a consistent and standardized manner across the DoD. In FY14, DON will provide OSD a draft version of the Navy SECCM KSA matrix. DON will share experience gained from KSAs to SE competencies.

2.3 Department of the Navy SE Workforce

Table 2 depicts the total number of Civilians and Military Acquisition ENG Personnel. Table 3 provides the planned growth in civilian and military acquisition-coded ENG. The information contained in these tables is influenced by factors such as SYSCOMs priorities, available funding, sequestration, and hiring freeze.

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Table 2. Total Number of Civilian and Military Acquisition ENG

Fiscal Year	Year Ending	US Navy
FY05	30-Sep-05	16,886
FY06	30-Sep-06	16,688
FY07	30-Sep-07	16,804
FY08	30-Sep-08	16,576
FY09	30-Sep-09	18,085
FY10	30-Sep-10	19,270
FY11	30-Sep-11	19,325
FY12	30-Sep-12	19,498
FY13	30-Sep-13	19,589[1]

[1]DON FY13 personnel on-board as of 9/30/2013. Source: DACM MIS.

Table 3. Projected End Strength in Civilian and Military Acquisition-Coded ENG

Projected End Strength in Civilian and Military Acquisition-Coded ENG		
Fiscal Year	**Year Ending**	**US Navy**
		Projected End Strength (Note 1)
FY14	30-Sep-14	20,290
FY15	30-Sep-15	20,396
FY16	30-Sep-16	20,402
FY17	30-Sep-17	20,393
FY18	30-Sep-18	20,257
FY19	30-Sep-19	Not available
Note 1: DON Projected E/S based on SE Workforce Requirements (per PB-14, Exhibit 23)		

The projected end strength in Table 3 is based on SE workforce requirements as submitted in PB-14.

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Table 4 summarizes the SE contractor workforce support delivered to the DON during FY12. This data was reported to Congress by the DoD in an effort to improve visibility into, and accountability of, contracted services in accordance with title 10, U.S.C, section 2330a. The Inventory of Contracts for Services delivered for FY12 reflects input from across the DoD, including the Military Departments, Defense Agencies, and DoD Field Activities[1].

Table 4. Total SE Contractor Workforce (in FTEs) for DON

Fiscal Year	FSC	Contractor FTEs
2012	Total FSCs	16,416

The data in Table 4 was extracted from the Inventory of Contracts for Services database using the Product Service Codes shown in Table 5 to denote SE effort. These numbers reflect no filtering by requiring organization within the DON.

Table 5. SE Product Services Codes[2, 3]

R414 (Support- Professional: SE Services)
R421 (Support- Professional: Technical Assistance)
R425 (Support- Professional: Engineering/Technical)

This summary reflects the latest information available as of publication of this Annual Report. FY13 contractor workforce data will not be provided to Congress until mid-2014 in accordance with the requirements of sections 235 and 2330a of title 10, United States Code.

These numbers are based on product service codes and do not provide position-specific information such as acquisition job functions that might confirm that these FTEs reflect high-value SE support. In addition, selection of product service codes occurs locally at the individual contract level and may result in differing interpretations of contract work content across the DON and activities. Although contractors are encouraged to parse contract task orders to reflect multiple functions (i.e., product service codes), this requirement is enforced at the local contracting activity and program level.

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[1] Source: Defense Procurement and Acquisition Policy (DPAP) website
http://www.acq.osd.mil/dpap/cpic/cp/acquisition_of_services_policy.html (only DON numbers shown)
[2] Source: U.S. General Services Administration Office of Government-wide Policy, **Federal Procurement Data System Product and Service Codes Manual**, August 2011 Edition (Effective Date: October 1, 2011), pp. 103, 217.
[3] Note that both R414 and R421 were end-dated and merged into PSC R425; legacy data retained effective October 2011.

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The data in Table 4 reflects the best available approximation of the actual contractor workforce numbers. At this time, the Navy does not have an estimate of the projected contactor workforce.

3.0 Summary of Navy Planned Areas for Improvement in FY14

1. DASN (RDT&E) will be completing a Systems Engineering Streamlining Initiative (SESI). The overall goal of the SESI is to identify efficiencies in current SE processes.
2. The SESG will be revising the following policies to incorporate lesson learned from integrating SE efforts across the SYSCOMs :
   - Joint SYSCOM SE & Technical Authority Instruction
   - Naval SYSCOM Risk Management (RM) Instruction
   - Joint SYSCOM Standards Instruction
3. The Naval SETR Guidebook will be incrementally revised and web links to the I&I SETR criteria will be added to this Guidebook.
4. DASN (RDT&E) will be working with SPAWAR on the FRACAS process that is required throughout the life cycle.
5. SPAWAR will continue to examine development of TWH in light of emergent technologies and new product lines related to IT and IA, as well as its existing C4I, Enterprise Information Systems, and Space Systems areas of SE development.
6. The revised NSoSEG will be issued.
7. EXARM lessons learned will be available.
8. DON will become the DoD Executive Agent for the SMART Program.
9. DON will continue to participate in the NAIP, SMART, and Pathways programs.
10. The SECCM will be validated through the Office of Personnel Management (OPM) uniform guidelines.
11. SYSCOMS will provide feedback on SECCM.
12. KLP Qualification Board project will be implemented to qualify personnel to fill mandatory KLP.

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APPENDIX C

Department of the Air Force
Systems Engineering Self-Assessment

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Headquarters United States Air Force

Department of Defense Systems Engineering FY 2013 Annual Report

Prepared by the Office of the Assistant Secretary of the Air Force (Acquisition)

1060 Air Force Pentagon
Washington DC 20330-1060

15 November 2013

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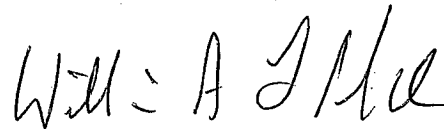
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Executive Summary

Quote from "Global Vigilance, Global Reach, Global Power for America":
"Our Nation requires not only a flexible, precise, and lethal force that is capable of rapidly responding anywhere on the globe, to protect and advance America's interests, but also one that can do so at a relatively low cost in relation to the return on investment."

The focus of Air Force acquisition is to provide tactical and strategic superiority to warfighters across the air, space and cyberspace domains. Our rapidly evolving security environment and today's significant fiscal constraints provide an unprecedented level of complexity in delivering those weapon systems to the battlefield. It is imperative that we institute even more rigorous systems engineering policies and practices across the acquisition lifecycle to ensure better systems in less time and cost with less risk.

I am particularly pleased to report on the significant progress the Air Force has made on implementation of acquisition systems engineering. Our focus in Fiscal Year 2013 on refining Air Force engineering enterprise governance and policy, enabling high-quality engineering decisions and seamless communication, improving engineering information management and standardization, and addressing engineering workforce issues, has already paid dividends. Our renewed long-term view and strategy will allow us to more efficiently and effectively deliver capabilities.

While the future remains uncertain, I am confident our efforts are on the right path. The Air Force has charted a clear and innovative course to integrate rigorous systems engineering in weapon system acquisition.

WILLIAM A. LAPLANTE
Principal Deputy Assistant Secretary
of the AF (Acquisition)

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Air Force FY2013 Systems Engineering Self-Assessments

1   Progress and Plans for Improved Service Systems Engineering Capability

1.1   Service-Level Systems Engineering Strategy

The U.S. Air Force has significantly revamped its strategy to improve systems engineering (SE). At the center of the initiative is direction from the Secretary of the Air Force (SECAF). As a result, the Assistant Secretary of the Air Force (Acquisition) (SAF/AQ) began by designating the Deputy Assistant Secretary of the Air Force (Science, Technology, and Engineering) (SAF/AQR) as the Air Force Chief Engineer and Technical Authority for all Air Force acquisitions.

SAF/AQR serves as the Air Force Science and Technology (S&T) Executive, Air Force Chief Engineer and Technical Authority, Air Force Standardization Executive, and Functional Manager for the Scientist and Engineer (S&E) Career Field. As the Air Force Chief Engineer and Technical Authority, SAF/AQR has several responsibilities for technical oversight and support of Major Defense Acquisition Programs (MDAPs). To support the program execution chain (see Figure 1), SAF/AQR as Air Force Chief Engineer provides unbiased technical advice to the Service Acquisition Executive (SAE) for pre-acquisition investment decisions and throughout programs' acquisition lifecycles. A key means for providing this advice is meeting with Program Executive Officer (PEO) Lead Systems Engineers (LSEs) and PM LSEs to discuss technical issues prior to SAE-chaired reviews. SAF/AQR supports MDAPs directly by assisting programs in Systems Engineering Plan (SEP) development, reviewing and coordinating on staffed SEPs, and owning the Air Force Technology Readiness Assessment (TRA) process. Technical execution and oversight of lower level ACAT programs, to include SEPs and TRAs, is delegated to the PEO. For MDAPs and lower level ACAT programs, SAF/AQR engages the Implementing Commands and Center-level engineering offices to provide technical support to PEOs and Program Managers (PMs) and can direct an external assessment of a program to help mitigate critical technical risk. SAF/AQR also impacts programs by overseeing Air Force engineering policy and guidance, and in the last year has made significant efforts to streamline policy.
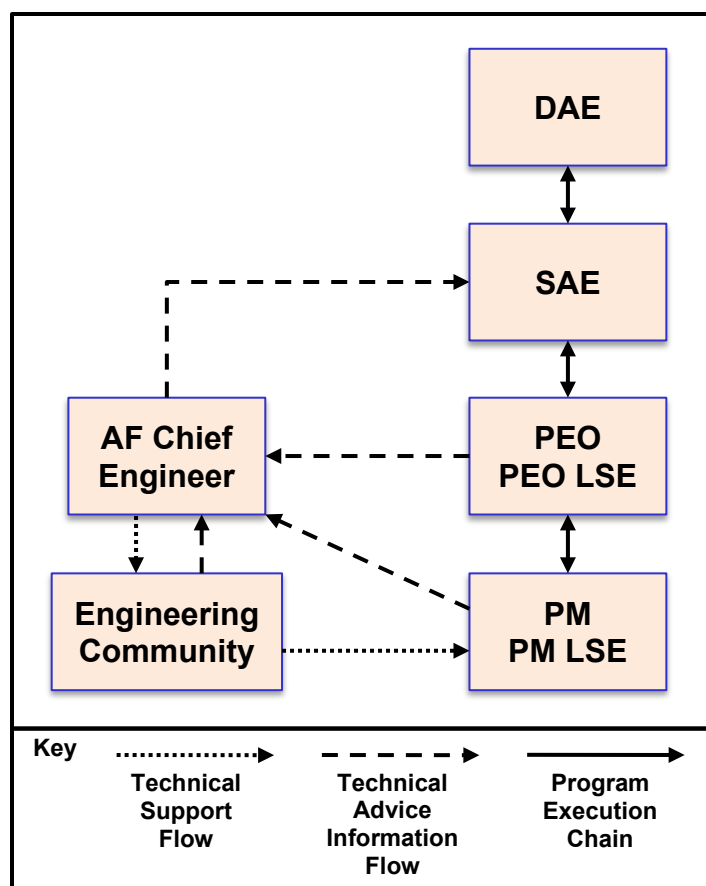
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Figure 1: Air Force Chief Engineer and the Program Execution Chain

To provide SAF/AQR the support necessary to execute its Air Force Chief Engineer responsibilities, SAF/AQ reorganized its staffing structure by providing SAF/AQR an SES level Deputy dedicated to leading Air Force engineering efforts (approved by the SECAF) and reconstituting SAF/AQRE, SAF/AQR's engineering division. SAF/AQRE, responsible for strategic-level engineering planning and policy, finalized restructuring to achieve the manpower and expertise necessary to cover the range of engineering discipline responsibilities. Focus areas include program technical support, policy formulation, modeling and simulation (M&S), standardization, reliability and maintainability (R&M), and pre-Milestone A and pre-Milestone B systems analysis and SE. Additionally, the Air Force Corrosion Control and Prevention Executive (CCPE) and the Air Force Human Systems Integration Office (AFHSIO) were aligned under SAF/AQR to better integrate SE with the material and human systems disciplines, respectively.

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To address the SECAF's concerns about SE, SAF/AQR formulated a strategy for overhauling the technical capability of the Air Force which included unifying all of engineering into the Air Force Engineering Enterprise (EE). The Air Force EE is defined as the network of interdependent engineers, scientists, and technical managers; processes; and supporting infrastructure providing Air Force mission capability by shaping requirements and providing technical leadership for research, development, test, manufacturing, deployment, sustainment, and disposal of Air Force systems and systems-of-systems. It includes members from Air Force Headquarters and the Implementing Commands, Air Force Materiel Command (AFMC) and Air Force Space Command (AFSPC). The EE reinforces the Air Force concept of a highly technical service built on a foundation of engineering discipline and expertise, as well as a culture of innovation, competency and integrity. The Air Force EE's mission is to provide superior technical expertise to plan, acquire, & sustain dominant war-fighting capability through efficiency, effectiveness, and innovation.

The Air Force EE has a governance structure (see Figure 2) which provides leadership and guidance for the strategic planning process, as well as oversight and accountability of the implementation activities. It is composed of senior Air Force advisory and senior engineering leadership members who guide the actions necessary to achieve strategic priorities. There are three levels in this structure 1) the Senior Advisory Council, 2) the EE Executive Council (EEEC), and 3) the Priority Champions. The Senior Advisory Council, chaired by SAF/AQ and includes the executive directors from AFMC and AFSPC, acts as a deliberative body that guides the Air Force engineering strategic approach and provides executive perspective on budget, people, and resourcing. The Air Force EEEC, chaired by SAF/AQR and includes the directors from the engineering staffs of AFMC and AFSPC's Space and Missile Systems Center (SMC), as well as the Air Force Senior Leader (SL) for SE, is the primary EE decision body and is responsible for implementing a comprehensive and actionable strategic planning approach. This strategic approach includes the core priorities for the transformation of the EE. Each priority is led by a general officer-level Priority Champion, who is responsible for developing goals, establishing goal teams, and leading the implementation process.
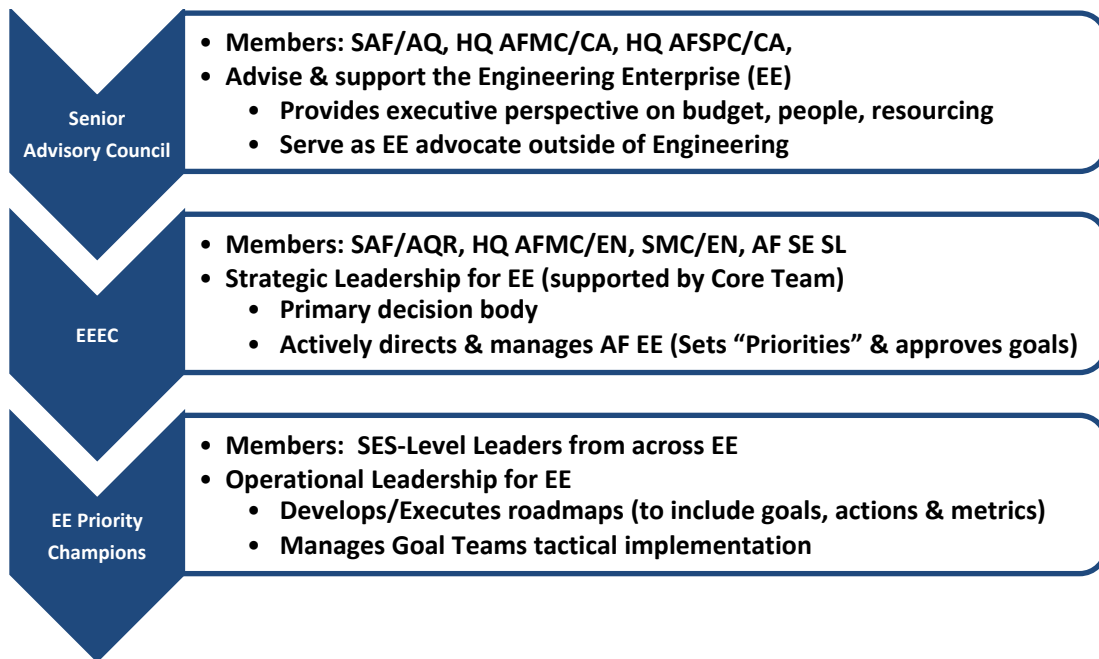
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Figure 2: Air Force Engineering Enterprise Governance Structure

The Air Force EEEC has developed a strategic planning model to address the challenges of the current environment. The strategic planning model defines how leadership will develop strategic direction down to actions and implementation and includes a description of the required planning documentation as well as the battle rhythm for all engineering strategic planning activities. At the core of the model is the strategic plan, currently in draft, which will span ten years and be revisited every four years to ensure alignment with Air Force, Department of Defense (DoD) and national strategic objectives. It contains the EE priorities envisioned by the EEEC. To implement the priorities, an operational-level EE roadmap will describe the goals in greater detail and provide a high-level overview of the objectives required to meet those goals. The roadmap will span four years and be revisited every two years to ensure alignment with the strategic plan. Finally, EE action plans will describe the objectives in further detail and provide near-term, actionable tactics for achieving those objectives. The action plans will span two years and be revisited annually to ensure alignment with the Roadmap. The detailed tasks defined in each action plan will be the basis for measuring progress towards accomplishing the objectives, goals, priorities, and ultimately the EE mission. The four EE strategic priorities include:

1. Refine Air Force engineering enterprise governance, roles and responsibilities, and supporting policy,

2. Enable high-quality engineering decisions and seamless communication,

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3. Improve engineering rigor through technical information management and standardization, and

4. Address engineering workforce issues, including core competencies, structure, development and assignments.

These four priorities laid out in the EE Strategic Plan aim at improving the engineering workforce and the utilization and collaboration of that workforce in order to provide PMs the technical competencies needed to execute successful development and sustainment programs. SAF/AQR, in Fiscal Year (FY) 2014, will implement specific practices to provide PMs with additional internal and external technical expertise and support. One practice will provide technical subject-matter experts (SMEs) to participate in program principal formal technical reviews, such as the Critical Design Review (CDR), to help ensure designs are technically feasible and technical risk has been adequately understood and mitigated. Another practice will foster a technical discussion between SAF/AQR and the engineering leadership at the program office to improve communication and information flow to decision makers. To improve programs' SE planning efforts, SAF/AQR will work closely with other Air Force Headquarters staffs to ensure adequate cross functional considerations for logistics; human systems integration (HSI); environment, safety, and occupational health (ESOH); operations; etc…

Achieving affordable programs is a focus area of the Department's Better Buying Power 2.0 initiative. Successful implementation requires a greater integration of systems engineering, cost analysis, and requirements development. The EE can influence the requirements and cost capability trades that programs conduct throughout the acquisition lifecycle. SAF/AQR's pre-planning team efforts to insert technical realism and cost realities into pre-MS A requirements development is one component of an overall Air Force goal to develop and implement a process for cost capability analysis. MDAPs addressing affordability in FY13 include (Three-Dimensional Expeditionary Long-Range Radar (3DELRR), Presidential Aircraft Recapitalization (PAR), and F-15 Eagle Passive/Active Warning and Survivability System (F-15 EPAWSS). 3DELRR is employing requirements reduction and re-prioritization and a best value source selection. The PAR Requirements & Sustainment Trade Analysis (RASTA) seeks to explain how PAR capabilities and requirements can affect and shape the requirements and configurations for both PAR and the follow-on Command and Control platforms. The F-15 EPAWSS cost capability analysis helped the analysis of alternative (AoA) team recommend a non-developmental replacement for the F-15 Tactical Electronic Warfare System (TEWS).

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FY14 Objectives

1. Release of EE Strategic Plan and EE Roadmap

2. Provide roles and responsibilities guidance to EE on technical support to programs and advice to the Air Force Technical Authority

1.2 Pre-Milestone A and Pre-Milestone B Rigorous Systems Analysis and Systems Engineering Process (Pub. L. 111-23, title I, Sec. 102(b)(1)(B)(i))

...we must streamline our processes and oversight to provide value added. This includes promptly acquiring relevant data and directing differences of opinion to appropriate decision makers. Our managers cannot be effective if process consumes all of their most precious resource – time.

Better Buying Power 2.0, April 2013

Policy Changes

The Air Force PEOs have echoed Mr. Frank Kendall's concerns as identified in the Better Buying Memorandum 2.0,"excessive and burdensome engineering policy still exists and if eliminated could focus the engineering enterprise on value-added activity." Therefore, SAF/AQR continues to review existing policy for potential areas of consolidation, clarification and to identify policy gaps. An updated AFI 63-101, *Integrated Life Cycle Management*, was published in March 2013 and streamlined SE policy.

Modeling and Simulation

Efforts continue to integrate Air Force M&S enterprise efforts among the three pillars of life cycle management, analytics, and testing/training. SAF/AQR support to DASD(SE) is being provided, through the Acquisition Modeling & Simulation Working Group (AMSWG), to improve the application of M&S in acquisition management. These efforts also address aspects of M&S to include acquisition community engagement in the Joint Capabilities Integration and Development (JCIDS) and Planning, Programming, Budgeting, and Execution (PPB&E) processes, in order to assess capabilities, reduce acquisition time, reduce risk, and decrease overall costs to Department of Defense (DoD).

One such effort was the use of the Computational Research and Engineering Acquisition Tools and Environments (CREATE-AV) in support of a developmental conceptual design and high-fidelity simulation to assess unconventional concepts for the next generation transport -- possible replacements for C-5 and C-17. The concepts being studied using CREATE-AV software and HPCMP DSRC resources were blended wing and hybrid

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airships. Engineering data generated in this "pilot project" will form an aerodynamic database for these aircraft types, for which there is little (if any) data available to the conceptual design community.

Another effort was the use of model-based techniques to capture and analyze standardized architectural, requirements and scheduling models of mission systems used by the SMC Military Satellite Communications Directorate. The use of these techniques enabled the program office to assess alternatives with respect to the system requirements and identify cost drivers and integration disconnects.

Value-Added Decision Analysis

Finally, SAF/AQR, as the Technical Authority and Air Force Chief Engineer, has started an initiative with the engineering community to revitalize the Air Force EE. The focus of this initiative is two-fold: to improve engineering and technical support to programs; and, to ensure the Air Force Chief Engineer is better informed of the technical risks of programs, including high risk technologies, and advise the SAE and senior leaders on these risks before the program passes through any acquisition gate.

Air Force Research Laboratory (AFRL) SE Contributions

SAF/AQR recognizes AFRL as an important contributor to rigorous system analysis and SE to reduce high-acquisition risk. AFRL develops and matures technology options for transition into Air Force weapon and support systems. Successful technology demonstrations and transition of those technologies is critical to the success of Air Force acquisition. AFRL leadership recognized using a disciplined early SE process coupled with early Manufacturing Technology (ManTech) involvement would provide the foundation for programs to transition with requisite technical maturity to address warfighter gaps. First, in 2012 AFRL assigned Science and Technology (S&T) Chief Engineers (CEs), with strong SE background and program office experience, in each of the Technology Directorates (TDs). Immediately thereafter, AFRL S&T CEs were conducting and documenting early SE activities in all major technology demonstration efforts. Finally, AFRL has codified in AFRLI 61-104, *Science and Technology (S&T) Systems Engineering (SE),* streamlined SE process and best practices required of AFRL technology programs.

Air Force Space Command (AFSPC) SE Contributions

AFSPC Space and Missile Systems Center (SMC) completed several efforts in 2013 that contributed to providing engineers with tools to assist in performing their job. SMC focused activities in the specialty areas of mission assurance and program protection

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planning. SMC developed SMC-G-007, *Mission Assurance Tailoring Guidebook.* This document provides overarching guidance for space SE and mission assurance requirements beginning at the earliest stages of acquisition. This guidebook was designed for government personnel; however, it has proved useful to industry in analyzing program mission assurance.

An SMC Programmatic ESOH Evaluation (PESHE) Instruction and directorate-level Operating Instruction (OI) were approved in July 2013 and March 2013, respectively. SMC developed instructions and templates that assist programs with the identification of ESOH programmatic risks and associated mitigation alternatives associated with the integration of ESOH into the system engineering process, as required by DoDI 5000.02, with little or no additional contractor resources.

SMC continued to apply a robust Program Protection Planning (PPP) approach to all PEO Space programs with two initiatives. The first initiative was the development and implementation of a comprehensive PPP template addressing each protection tenet (e.g. Cyber threats, anti-tamper planning, etc.). The second initiative was a center-wide Threat Assessment Center (TAC) reporting process that addresses the identification and validation of specific supply chain threats. These two initiatives have equipped program managers and security engineers with both guidance and tools to develop effective PPPs, including mitigation strategies.

Finally, SMC created a systems acquisition lifecycle protection tool for National Security Systems, which identifies required activities across the lifecycle that are required for program protection plans, security classification guides, information assurance compliance, and supply chain risk management strategies.

Air Force Materiel Command (AFMC) SE Contributions

AFLCMC has a "pilot" weapons program assessment initiative designed to integrate risk identification efforts and develop higher fidelity cost estimates earlier in the life cycle. The initiate should enable AFLCMC " to minimize cost, schedule and technical breaches of weapon programs. The center-wide pilot program was launched with programs selected from nine Program Executive Officers (PEOs). The pilot program, which concluded on 30 Sep 2013, will be the basis to assess initiative utility. A final decision on whether the initiative will become mandatory for AFLCMC is expected in early FY14.

AFMC published an Information/Program Protection Process Guide, dated 18 Dec 2012. This guide integrates processes (e.g., program protection planning, operations security, unit security program management) for managing risk of advanced technology from

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foreign collection, design vulnerability or supply chain exploit/insertion. In addition, the guide streamlines coordination processes of required documentation, and provides SME points of contact to assist in the vulnerability analysis and risk mitigation strategies.

FY14 Objectives

SAF/AQR will develop a process for engineering policy formulation and updates—a policy architecture. This architecture will identify the portfolio of engineering policy needed and provide a framework to accommodate future changes and keep a stern hand on policy proliferation.

SAF/AQR will provide headquarters-level guidance to the Air Force EE on roles and responsibilities as it relates to technical support to programs and advice to the Air Force Technical Authority. This will establish the role of the Air Force Technical Authority as levied in the Headquarters Air Force Mission Directive 1-10 (HAFMD 1-10), dated 27 June 2013. The desired end-state is a functioning Technical Authority that increases the value of the engineering perspective and adds to program success by providing programs analytical rigor and unbiased support.

AFRL will continue to refine early SE to reduce high-acquisition risk. In accordance with the newly developed AFRLI 61-104, each TD S&T CE will document the TD's tailored application of the S&T SE process in a TD operating instruction (OI) or supplement.

SMC will develop a center-level enterprise SEP with annexes to document program level data. A single cornerstone SEP will document the common processes and gain efficiencies and standardizations in SE planning and approaches across the Center.

SMC will develop a process for assessing software health. The intent is to provide an independent assessment to the program manager on the software development, thereby addressing programmatic software risk which impacts many programs.

1.3 Reliability, availability, maintainability, and sustainability as an integral part of design and development (Pub. L. 111-23, title I, Sec. 102(b)(1)(B)(ii))

The Air Force has collaborated with DASD(SE), the other Defense Services, and every major organization within the Air Force to ensure RAM is addressed holistically throughout the Lifecycle of product or system as well as ensuring the proper visibility at every level of leadership. In doing so, the Air Force is ensuring the appropriate practices, processes, and policies are in place to guarantee long term sustainability of our current and future weapon systems.

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1. Over 160 individuals are scheduled to complete training by the end of the FY13 through two Reliability Foundation Courses developed by the Air Force Institute of Technology (AFIT). A third complementary Reliability Course is currently being developed by AFIT's Graduate School of Engineering, Department of Operational Sciences and is scheduled for deployment to the RAM workforce in FY14.

2. The Air Force has continued to collaborate with OSD and the Army and Navy through the Service Leads meetings held by DASD(SE). Such efforts include refining the DAES Reliability Growth Curve (RGC) reporting requirement mandated under DTM 11-003, the development and review of the OSD RAM Engineering Guide, improving RAM-C Rationale Report Guidance, and the ongoing human capital initiatives for the RAM workforce.

3. The Air Force Life Cycle Management Center (AFLCMC) Reliability Working Group (RWG) continues to evolve. AFLCMC's Product Support Engineering Division continues to work through the appropriate objectives, tasks and governance structure of the RWG and is expected to formalize this strategy in the months to come.

4. The revised Air Force acquisition policy, AFI 63-101/20-101, establishes the Integrated Life Cycle Management (ILCM) guidelines and procedures for Air Force personnel and programs. This revision created several new or updated program management responsibilities for addressing RAM issues. These responsibilities include: Reliability Centered Maintenance (RCM) and Conditioned Based Maintenance Plus (CBM+) requirements, the assurance of Operational Safety, Suitability, and Effectiveness (OSS&E), the inclusion of reliability growth strategies and RGCs in the SEP, the inclusion of RGCs and verification methods for RAM requirements in the TEMP, and cost reporting requirements which require the CFO to ensure the appropriate data elements for military equipment and modifications are recorded in Reliability and Maintainability Information System (REMIS). A team of senior Air Force Reliability & Maintainability (R&M) engineers developed this language to ensure AFI 63-101/20-101 outlines the necessary requirements for Air Force programs to achieve R&M goals.

In addition, the Air Force began several new initiatives in 2013 as part of a Service-wide strategy to better equip the engineering workforce and improve the performance of RAM activities within Air Force acquisition programs. Activities include:

1. AFLCMC initiated the first annual R&M Programs Health Assessment. The results of this Health Assessment will be evaluated later this year by AFMC and AFLCMC and AFMC to assess the overall health of Air Force RAM programs. This assessment is

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expected to provide insight on the health of a program's processes, products and expertise. A separate survey provides the Program Office's RCM initiatives for risk-based Programmed Depot Maintenance (PDM) strategies (i.e. CBM, maintenance scheduling from reliability based statistical failure distribution analysis, etc.). The R&M Program Health Assessment and RCM initiatives gap analyses are key in determining the focus of future strategic efforts related to Air Force RAM programs.

2. In order to better assess contractor analysis of RAM related requirements, AFLCMC is improving its capabilities for independent assessment of concept weapon system mission effectiveness. AFLCMC's Engineering Resilient Systems task establishes methodology assessing how multiple different weapon system design attributes impact mission effectiveness for various missions. This is a first step in properly correlating RAM related requirements and trade space during requirements development and will facilitate more precise RAM related requirements definition in future contracts for major defense acquisition programs. AFLCMC plans to integrate this capability with already well developed methodologies for assessing cost and then expanding this capability to incorporate sustainability.

3. AFLCMC has created Individual Development Plans to ensure that R&M Trainees receive the appropriate specialized education they need to support RAM requirements for Air Force programs. A small number of Section 852 DAWDF funded, Palace Acquire (PAQ) interns enter the R&M track each year and upon completion will be deployed to various program offices within the Center. These individuals will initially work in small programs supported by Center experts and will progress to larger, more complex programs as skills mature. In addition, several candidates from other engineering disciplines have been selected to cross train into the Reliability Engineering and will follow a similar path as the interns.

4. The Air Force expanded the Service-wide R&M Working Group to include SMEs from Acquisition, Test & Evaluation, Maintenance, Policy, Analysis, and Academia. These SMEs work together to optimize Air Force policies and practices as they relate to current and future RAM initiatives. An online collaboration environment has been created to facilitate this collaboration and there are currently plans to open this site to the RAM community at large.

5. AFMC led a detailed review of OSS&E. The team included representatives from AFLCMC's Engineering Directorate and PEO portfolios. The team was chartered to review the OSS&E definition and assess metrics for each category, element and sub-element. The team developed a standardized OSS&E metrics taxonomy, prioritized metrics and recommended top level business rules for collecting, reviewing and

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reporting metrics. AFLCMC SMEs ensured RAM metrics were properly incorporated to further enforce RAM and ensure consistency. Future efforts include recommendations to update Air Force and AFMC policy and guidance. The team will also determine if an automated metric reporting tool is warranted.

6. SAF/IEL created the Air Force's Product Support Enterprise Vision (PSEV) which identifies Product Support Engineering as a major capability. This new PSEV requires key Engineering specialists, such as Reliability, Maintainability, Quality, Manufacturing, etc., become involved early in the process of developing Air Force weapon systems to ensure affordability and sustainability throughout its useful life.

7. SAF/AQR initiated the Certification & Accreditation (C&A) process for a standard suite of software tools to be used by Air Force R&M SMEs. This process will enable Program Offices to acquire the tools needed to satisfy the planning and analysis requirements outlined in DTM 11-003. Standardizing on tools allows SMEs from multiple programs to collaborate on common activities, share lessons learned and exchange expertise more freely.

8. The Air Force is reviewing current internal policies and guidance to ensure consistency with new mandates from OSD. Currently, AF/A4L is in the process of updating RAM policy for fielded systems through a revision of AFI 21-118, *Improving Air and Space Equipment Reliability and Maintainability*. In addition, the Air Force is exploring various policy changes and mechanisms to positively affect systems which are early in the development and acquisition lifecycle.

9. The AFLCMC Systems Analysis Division is enhancing the Logistics Composite Model Toolkit (LCOM ATK) to better support decision makers across the enterprise. LCOM ATK is the premier M&S tool for investigation of RAM issues and effects. Enhancements include direct calculation of system availability in direct support of mandated RAM reporting requirements. Additional enhancements underway include linking RAM metrics with cost estimates to support a systematic and quantitative assessment methodology supporting design, development, test and sustainment.

SAF/AQR and AF R&M SMEs have worked with, and will continue to work with, a number of MDAPs to review and improve their requirements, planning and contractual strategies for R&M related activities and deliverables. SAF/AQR will continue to call upon experts from across the Air Force to assist Programs with future R&M efforts to improve the standard of quality with our acquired systems and services.

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FY14 Objectives

In the coming year, the Air Force will continue to improve R&M processes and practices in a number of ways. Most notably, the Air Force will pursue:

1. A clear framework for R&M Policy for Acquisition Programs which incorporates the latest guidance from DASD(SE) and includes leveraging standards and guidance from both government and industry sources.

2. A common Information Technology and Knowledge Sharing infrastructure which includes data systems and analysis tools to ensure R&M Engineers have the best resources available for making informed decisions and tradeoffs.

1.4   Systems Engineering Requirements During the JCIDS Process and in Contract Requirements for each MDAP (Pub. L. 111-23, title I, Sec. 102(b)(1)(B)(iii))

Acquisition leaders must work with requirements leaders early and effectively throughout the lifecycle of a product…….Acquisition leaders need to understand user priorities, and requirements leaders need to understand cost performance trade-offs and technical risk implications. This can only happen if there is a strong continued communication between requirements and acquisition communities.

<div align="right">Better Buying Power 2.0, April 2013</div>

Policy Changes

In 2013, SAF/AQR analyzed SE pre-Milestone A requirements. One of the actions was to analyze policy gaps. After review of Air Force headquarters' policy, a gap was identified with respect to Concept Characterization and Technical Descriptions (CCTDs). CCTDs, as a deliverable prior to AoA study planning, was missing from AFI 10-601, *Operational Capability Requirements Development*. AFI 10-601 is in coordination and CCTD content has been added, thereby, eliminating any policy gaps.

AFMC updated the Request for Proposal (RFP) Technical Content, dated 11 Sep 2013, to cover Non-Developmental Items. The RFP engineering guide now provides suggested language for inclusion in the Statement of Objectives, system specification, and sections L and M of an RFP to provide more clarity on what NDI means and its broader implications for inclusion in a procurement.

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Air Force Requirements Review Group (AFRRG)

The Fall 2011 CORONA (a gathering of Air Force generals from the unified combatant commands and major commands) agenda included a topic on how to improve acquisition program success. Tight linkage between requirements development and acquisition was envisioned as an enabler for a better informed Air Force Requirements Oversight Council (AFROC), thereby increasing program success. Therefore, AF/A3/A5 and SAF/AQ were directed to establish the AFRRG and in 2013, the AFRRG met regularly to review all Air Force requirements documents and analysis of alternatives (AoA) concepts. SAF/AQX and SAF/AQR, as members of the AFRRG, have ensured tight linkage between requirements, technology maturity, and accomplishment of sufficient early SE to inform cost and capability analyses. In sum, the goal of the AFRRG is to preclude acquisition programs from attempting to satisfy poorly defined and potentially unaffordable and/or unattainable requirements. 9The AFRRG is in its infancy, and early indication is that requirements are being properly vetted prior to proceeding to the AFROC.

Pre-planning Team

Another goal of CORONA was to "improve understanding of requirements on cost and cycle time to inform affordability". Additionally, the FY12 DOT&E Annual Report stated "the need for closer coordination and cooperation among the requirements, acquisition, and testing communities; the need for well-defined testable requirements; the alignment of acquisition strategies and test plans". In FY13, in order to address these goals, the Air Force worked to improve Development Planning (DP) activities by forming a pre-planning team in SAF/AQR. This team supports better SE practices by early involvement with the MAJCOMs. This goal of this team is to provide technical advice on development of requirements to enable better informed AFROC decisions. This has been achieved by engaging engineering organizations before AoA and concept decisions, and assisting new start proposals by instilling technical realism and cost realities. The pre-program planning working group supports new acquisition activities by providing guidance in DP (i.e., Initial Concept Documents (ICD), CCTD, AoA study plan/guidance, Concept Development Documents (CDD)).

AFRL is actively engaged in Air Force DP activities. AFRL has representation at all levels of the Air Force DP governance structure. DP efforts approved through the governance structure include personnel from AFRL on the execution team to provide technical expertise and to ensure any science and technology needs associated with the effort are properly identified and communicated.

Programs supported by early involvement of SE during DP include: Joint Equipment Service Wipe CDD, Transportable Tactical Command (TCT2) CDD, Network Tactical

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Common Data Link CDD, Cyberspace Vulnerability Assessment/Hunter (CVA/H) CDD, Presidential Aircraft Recapitalization (PAR) Requirements and Sustainment Trade Analysis (RASTA) CCTD, Integrating Architecture for Air and Space Live, Virtual, Constructive Environments (IA-ASLVCE) CCTD as well as the CCTD still in development in anticipation of MDD for Air Dominance 20+.

FY14 Objectives

SAF/AQR has been involved in four years of DP and early SE and has had many opportunities to observe and assess the Air Force's ability to conduct DP/SE. There are inconsistencies in the Air Force DP efforts and some confusion resulting from multiple guides and handbooks. Therefore, SAF/AQR will embark on a DP product improvement initiative to ensure DP policy and guidance originates from the Headquarters Air Force.

1.5   Area of Identified Progress and Improvement: Corrosion

Several Air Force efforts are enhancing the ability to effectively address corrosion prevention within the SE process. For example, the Air Force Corrosion Prevention and Control (CPC) Program, coordinated by the Air Force Corrosion Control and Prevention Executive, has initiated an effort with the DoD Corrosion Policy and Oversight (CPO) office to re-establish a military standard to govern corrosion prevention issues within systems acquisition activities. In a similar policy initiative, the Air Force CPC Program is participating in development of a new DoD guidebook for corrosion prevention in defense systems.

The Air Force is aggressively pursuing alternatives to chromium-based anti-corrosion coatings, as part of the AFLCMC Chromium Elimination Strategy. Chromium based coatings have been preferred as a corrosion prevention mechanism in weapons systems for decades, but their human toxicity and environmental effects have made their replacement a DoD top corrosion-related priority. The Air Force has been leading the coordination of multiple Centers to identify preferred alternatives, and to enhance specifications to increase utilization of these alternatives in ways that provide greatest benefit to weapon system life cycles, as well as to health and the environment.

In addition, R&D investments are a major Air Force contribution. As part of a significant increase in corrosion prevention research efforts at the AFRL, in FY13 a new Structural Corrosion Component Simulation (SCCS) program was established that will lead to better understanding and modeling of corrosion on complex aerospace structures in diverse environments. This effort will enable better corrosion-resistant design principles and enhance the Aircraft Structural Integrity Program (ASIP), the foundational Air Force framework for aircraft structural health management.

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1.6 Area of Identified Progress and Improvement: Human Systems Integration

As introduced in last year's report, the Air Force launched efforts to re-energize the emphasis on Human Systems Integration (HSI) based on an Air Force Scientific Advisory Board's recommendation from the F-22 Aircraft Oxygen Generation Quicklook Study. SAF/AQ, AFLCMC/CC, and AF/SG approved fifteen action plans recommended by the high performance team chartered to determine how to improve HSI program execution, forcing functions, and workforce development across the Air Force. The action plans have one, two, or four-year implementation schedules. Three of the action plans are already complete, ten are expected to be completed in FY14, and only two are expected to take longer. The goals of the action plans are to have the HSI perspective explicitly represented at key participation points in the Integrated Life Cycle Management (ILCM) System and documented in JCIDS and program artifacts; and to ensure unresolved HSI issues are elevated to the PM and visible to senior decision makers. For example, AFLCMC efforts in FY14 include work to expand the SEP outline, add HSI as a focus area in the RFP engineering guide, and develop and distribute HSI entry and exit criteria for design reviews. Additionally, the 711 Human Performance Wing of the AFRL has resource and prioritization plans underway to support Air Force acquisition programs.

A new chapter on HSI will be included in a forthcoming Air Force Pamphlet, AFPAM 63-128, *Guide to Integrated Life Cycle Management*, to communicate 'best practices' for HSI in Air Force systems. The Air Force is partnered with joint, government, industry, and academic forums to continue improving and advocating for HSI.

In response to rapidly evolving budget constraints, the planned HSI courses for AFIT (SYS 261 and SYS 269) were combined into a single course (SYS 269) that has completed initial testing and will be incorporated into AFIT's FY14 continuing education offerings.

Reviews of ACAT I SEPs showed a continuation and improvement of HSI planning documentation.

A new chapter on HSI was added to the AoA Handbook published by the Air Force Office of Aerospace Studies. This Handbook is used by the Air Force and other DoD components.

1.7 Area of Identified Progress and Improvement: Standardization Program

Air Force standardization activities in 2013 are a continuation of efforts initiated with DASD(SE) and the other Military Departments in mid-2010 through the Defense

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Standardization Program and Defense Standardization Council (DSC) to address acquisition performance issues stemming from the loss of SE standard practices. Joint service working groups were formed to assess existing systems engineering technical documentation in the areas of SE, Technical Reviews and Audits, configuration management (CM), Logistics Support Analysis and Manufacturing. The Air Force is lead service for both SE; and Technical Reviews and Audits. The two working groups teamed to establish criteria for selection of a standards developing organization (SDO); this enabled each working group to select a non-government SDO and they have now commenced writing drafts of each standard. During 2013, two new working groups were established. The first; Manufacturing non-government standard working group, Air Force was appointed lead service. Using the SE and TR&A non-government SDO selection processes as models, the Manufacturing working group is currently deciding which SDO to select. Additionally, like SE and TR&A, the Manufacturing working group consulted with National Defense Industrial Association to ensure DoD objectives are compatible with and supported by industry partners. The second, DoD enterprise-wide access to non-government standards; is led by Army and supported by Air Force, other services and agencies. Its working group has been tasked to provide recommendations for improving access to non-government standards needed by DoD personnel to perform their jobs.

Logistics Support Analysis non-government standard development (led by Army and supported by Air Force) successfully concluded in late 2012 with publication of TechAmerica standard TA-STD-0017; which was adopted by DoD in June 2013. Its publication initiated a follow-on action, again led by Army and supported by Air Force; which resulted in MIL-HDBK-502A (March 2013); an updated handbook of related subject matter previously known as MIL-HDBK-502.

The Air Force is supporting the configuration management standard working group, under Navy leadership, efforts to define and develop a common DoD-suitable non-Government standard practice. In April 2013, the Air Force, at the request of Navy, provided the initial draft of the non-government standard.

SMC in conjunction with AFMC/LCMC, is leading a comparative analysis to examine existing SE policies, standards, and guides to determine where there may be opportunities for efficiencies in cross-Command standardization. Outputs from this initiative are reflected in the final report, including evaluation and recommendations as to which technical processes should be selected for standardization to create common documentation for use across all AFMC and AFSPC.

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1.8   Area of Identified Progress and Improvement: Environmental Management

SMC continued to review, interpret and update national, DoD and Air Force space debris mitigation policy, regulations, and standard practices. SMC Engineering Directorate developed local policy, processes and procedures that enable SMC programs to document the risk of producing space debris in standard-format Space Debris Assessment Reports (SDARs) and End of Life Plans (EOLPs). These documents feed into the Space Flight Worthiness Criteria to support launch decisions. The Engineering Directorate functional staff office engages with program offices early to ensure all analyses are complete and the SDAR/EOLP package appropriately documents space debris hazards in accordance with national and Air Force policy. SMC has worked with OSD and NASA for the proposed changes to the US Government Orbital Debris Mitigation Standard Practices to promote sustainability of space. SMC has incorporated SE standard procedures to perform trade-space assessment of launch vehicle design changes and mission design changes necessary to allow for compliant upper stage and satellite disposal. Recent SE successes include: design of new trajectory that will allow the GPS IIF-6 and GPS IIF-8 upper stages to meet orbital disposal requirements and optimization of propellant blow down at end of mission to reduce orbital lifetime (Space Based Infrared System (SBIRS) upper stage lifetime was reduced below 1 year and Advance Extremely High Frequency (AEHF) upper stage lifetime was reduced below 22 years).

The SMC Spectrum Management Office has implemented much of DoD and Air Force guidance regarding systems' use of the electromagnetic spectrum. As commercial demand for frequency spectrum increases and US regulatory agencies attempt to implement new federal government policies to make more spectrums available to commercial entities, spectrum is becoming an increasingly scarce and precious resource. Access to spectrum is subject to regulatory, operational, and technical constraints; all of these constraints affect technical solutions that result from applying the SE process. SMC has required space programs to document their current and proposed use of spectrum, subject to these types of constraints, in Spectrum Supportability Risk Assessments (SSRAs).   Upon identification of spectrum supportability risks and the steps needed to mitigate them, SMC integrates these risks and mitigation steps into the SE process where technical solutions are identified, tracked, and managed at an enterprise level.

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2   Systems Engineering Workforce

2.1   Workforce Development Initiatives

Overall SE and DP workforce strategy including evidence of FY13 progress

Air Force SE workforce initiatives continued to support goals established by the Service Acquisition Executive (SAE) in the 2009 Air Force Acquisition Human Capital Strategic Plan. The Air Force acquisition growth initiative, which began in 2008, helped support the Air Force goal of sizing the acquisition workforce based on program requirements. The initiative's goals were achieved in FY12. Sustainment of the growth was targeted at gaps identified by PEOs. The judicious use of FY 2008 NDAA Section 852 DAWDF-funded employment incentives, such as student loan repayment and first duty station move, has enhanced the Air Force's ability to attract and retain highly qualified recent graduates and experienced journeymen. As the workforce has stabilized in meeting growth goals, emphasis has increased on efforts to ensure adequate training, development, and retention of the acquisition workforce. An SE skills taxonomy is being developed under the oversight of the draft Engineering Enterprise Strategic Plan working group.

A major initiative within AFMC was AFRL's examination of mission areas in which SE rigor was critical to research and development efforts. AFRL identified 12.7% of its former STM positions for re-coding as SPRDE-SE. The effort ensures a cadre of SE professionals within the AFRL tasked with ensuring SE rigor in Laboratory programs. AFRL established Chief Engineer positions in its technical directorates to further increase emphasis on SE and ensure the application of SE technical and management processes across the Laboratory's R&D portfolio. AFMC increased the number of employees SPRDE-SE positions from 6,044 to 6,312.

The Air Force, branding and enterprise recruiting strategies for its acquisition workforce were fully implemented in FY13. Tailored to the unique challenges of each of its acquisition product, sustainment and test locations, this DAWDF-funded effort included development and maintenance of recruiting websites, enterprise-wide advertising and other recruitment materials and tools. Work was for all acquisition positions with a focus on creating a pool of high quality candidates and a continuing gateway for interest in Air Force acquisition positions.

Plans to improve SE and DP workforce in FY14

In 2013, the Air Force completed the first study of the state of health of the civilian and military STEM workforce. The study highlighted the increasing average age of the workforce in spite of retirements of "baby boomers," the reluctance to hire entry level

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employees because of limited options for recruitment and selection, the need to re-energize student hire programs, and the possibility the Air Force has been too restrictive in applying Laboratory Personnel Demonstration Program policies to a larger number of Air Force organizations beyond AFRL. SAF/AQR has pursued the expansion of either the Air Force Laboratory Personnel Demonstration Project (Lab Demo) or the Civilian Acquisition Workforce Personnel Demonstration Project (Acquisition Demo) personnel projects. The objectives were established by Air Force Global Horizons to ensure the vitality of the STEM workforce to 2018 and beyond. AFMC/EN and AFSPC/EN under the direction of the Engineering Council are working to provide a focused workforce development and assignment process across the Air Force to provide highly qualified and capable SEs to our customers and stakeholders as required. This effort includes consciously grooming our SE and DP workforce from the moment they are recruited throughout their entire career. Competency managers will orchestrate mentoring, succession planning, and development assignments of individuals to accomplish this goal using core competencies as the measure of success.

Looking forward to FY14, with its acquisition workforce growth initiative completed, the Air Force will advocate the use of DAWDF to implement an advance replenishment hiring strategy to hire recent graduates in advance of forecast attrition and retirements. This strategy will be used to develop a productive bench for replacement of losses, enabling timely recruiting, hiring, acculturation, initial skills training and knowledge transfer. The Air Force will continue to use DAWDF resources to respond rapidly as training and development gaps are identified.

Any changes from plans described in FY12

As the budget has become more constrained and the outlook more uncertain, DAWDF has increased in importance as an integral contributor to workforce development and retention strategies. DAWDF has provided resources needed to address training gaps and has enabled the Air Force to offer civilian acquisition workforce members the same acquisition training opportunities afforded their military counterparts. DAWDF funding was used to support geographic relocation of employees when no other funding was previously available to meet identified acquisition mission requirements.

2.2   SE Workforce Resourcing

Impact of budget cuts on AF total workforce (military, civilian, and contractors) and ability to meet program office needs

Preliminary assessments of the hiring freeze, sequestration, and furloughs are being developed but the long-term impact of FY13 financial constraints on the SE workforce is

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inconclusive at this time. The initial indications are that total Air Force SE workforce separation rates remain below the rates for the total Air Force. In fact, FY13 retention rates for engineers is the highest rate since FY09. Two possible explanations are offered. First, highly skilled engineers may require more time to search for and land the right job. Second, many engineers may be holding out for a VERA/VSIP buy-out.

AF progress in filling leadership positions (service level CEs and SPO SE technical leads). Include discussion of implementation of the OSD(AT&L) KLP policy

The Air Force has been instrumental in shaping OSD(AT&L) policy for the expansion of KLPs to ensure the policy is effective and executable in the current budget environment. USD(AT&L) KLP policy was under revision as of September 30, 2013, to incorporate component recommendations.

ID any additional authorities/resources needed to attract, develop, retain, and reward SEs to meet Air Force needs

The Air Force requires continuation of the DAWDF and Science, Mathematics and Research for Transformation (SMART) programs to ensure effective execution of acquisition workforce improvement initiatives for recruiting, hiring, training, and retention to support knowledge transfer and workforce replenishment. The Air Force is exploring the options of seeking increased coverage under the Acq Demo and/or Lab Demo. Expansion of either or both personnel demonstration projects will initially focus on the acquisition and STEM workforces including in either the Lab Demo or Acq Demo scenario the Air Force SE workforce.

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2.3   Department of the Air Force SE Workforce

Table 1: Systems Engineering Workforce in the Air Force

Total Number of Civilian and Military Acquisition SPRDE-SE/PSE Personnel		
Fiscal Year	Year Ending	US Air Force
FY05	30-Sep-05	6,505
FY06	30-Sep-06	6,237
FY07	30-Sep-07	6,162
FY08	30-Sep-08	6,429
FY09	30-Sep-09	7,197
FY10	30-Sep-10	7,625
FY11	30-Sep-11	8,514
FY12	30-Sep-12	8,649
FY13	30-Sep-13	8,474

Planned Growth in Civilian and Military ENG Personnel*			
Fiscal Year	Year Ending	US Air Force	
		Planned Growth	Projected End Strength
FY14	30-Sep-14	-74	8,400
FY15	30-Sep-15	-22	8,378
FY16	30-Sep-16	-23	8,355
FY17	30-Sep-17	-13	8,342
FY18	30-Sep-18	-10	8,332

Total Number of Non-Government Systems Engineering Support Personnel (FTEs)		
Fiscal Year	Year Ending	US Air Force**
FY12	30-Sep-12	10,547

*The SPRDE acquisition career field was renamed ENG effective September 30, 2013.

**Obtained from summing FY12 DPAP codes R414, R421, and R425

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Acronyms

ACAT	Acquisition Category
ADM	Acquisition Decision Memorandum
AFI	Air Force Instruction
AFIT	Air Force Institute of Technology
AFLCMC	Air Force Life Cycle Management Center
AFMC	Air Force Materiel Command
AoA	Analysis of Alternatives
APB	Acquisition Program Baseline
AS	Acquisition Strategy
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASN(RDA)	Assistant Secretary of the Navy for Research, Development, and Acquisition
AT&L	Acquisition, Technology, and Logistics
C4	command, control, communications, and computers
CDD	Capability Development Document
CDR	Critical Design Review
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
COTS	commercial off-the-shelf
CPD	Capability Production Document
CY	calendar year
DAB	Defense Acquisition Board
DAES	Defense Acquisition Executive Summary
DAG	Defense Acquisition Guidebook
DAPS	Defense Acquisition Program Support
DASD(SE)	Deputy Assistant Secretary of Defense for Systems Engineering
DASN(RDT&E)	Deputy Assistant Secretary of the Navy for Research, Development, Test, and Evaluation
DAU	Defense Acquisition University
DAWDF	Defense Acquisition Workforce Development Fund
DAWIA	Defense Acquisition Workforce Improvement Act

DoD	Department of Defense
DoDI	Department of Defense Instruction
DON	Department of the Navy
DOT&E	Director of Operational Test and Evaluation
DPAP	Defense Procurement and Acquisition Policy
DPWG	Development Planning Working Group
DTM	Directive-Type Memorandum
EMD	Engineering and Manufacturing Development (phase)
FDD	Full Deployment Decision
FIPT	Functional Integrated Product Team
FRP	Full-Rate Production
FTE	full-time equivalent
FY	fiscal year
GFE	Government-furnished equipment
HSI	human systems integration
IA	information assurance
ICD	Initial Capabilities Document
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronics Engineers
IIPT	Integrating Integrated Product Team
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IPR	In-Process Review
IPT	Integrated Product Team
ISR	intelligence, surveillance, and reconnaissance
IT	information technology
ITAB	Information Technology Advisory Board
JCIDS	Joint Capabilities Integration and Development System
JROC	Joint Requirements Oversight Council

KLP	Key Leadership Position
KPP	Key Performance Parameter
KSA	Key System Attribute
LRIP	Low-Rate Initial Production
M&S	modeling and simulation
MAIS	Major Automated Information System
MBSE	model-based systems engineering
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Materiel Development Decision
MRL	Manufacturing Readiness Level
MS	milestone
MSA	Materiel Solution Analysis (phase)
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NDAA	National Defense Authorization Act
NM	Nunn-McCurdy
NPS	Naval Postgraduate School
NSEG	Naval System Engineering Guide
O&S	Operations and Support (phase)
OIPT	Overarching Integrated Product Team
ORD	Operational Requirements Document
OSA	open systems architecture
OSD	Office of the Secretary of Defense
PARM	participating acquisition resource manager; participating manager
PD	Production and Deployment (phase)
PDR	Preliminary Design Review
PEO	Program Executive Office
PM	program manager

PMO	Program Management Office
PPP	Program Protection Plan
PQM	Production, Quality, and Manufacturing
PRR	Production Readiness Review
PSR	Program Support Review
R&M	reliability and maintainability
RAM	reliability, availability, and maintainability
RAM-C	reliability, availability, maintainability, and cost
RDT&E	research, development, test, and evaluation
RFP	request for proposal
S&T	science and technology
SAF/AQ	Assistant Secretary of the Air Force (Acquisition)
SE	systems engineering
SE WIPT	Systems Engineering Working Integrated Product Team
SEP	Systems Engineering Plan
SESG	Systems Engineering Stakeholders Group
SETR	Systems Engineering Technical Review
SFR	System Functional Review
SLOC	source lines of code
SoS	system of systems
SoSE&I	system of systems engineering and integration
SPAWAR	Space and Naval Warfare Systems Command
SPRDE	Systems Planning, Research, Development, and Engineering
SPRDE-PSE	Systems Planning, Research, Development, and Engineering–Program Systems Engineer
SPRDE-SE	Systems Planning, Research, Development, and Engineering–Systems Engineering
SRCA	systemic root cause analysis
SRR	System Requirements Review
STEM	science, technology, engineering, and mathematics
SWaP-C	space, weight, power, and cooling

SYSCOM	Systems Command
T&E	test and evaluation
TD	Technology Development (phase)
TDS	Technology Development Strategy
TEMP	Test and Evaluation Master Plan
TIM	technical information meeting; technical interchange meeting
TPM	Technical Performance Measure
TRA	Technology Readiness Assessment
TRL	Technology Readiness Level
TRR	Test Readiness Review
UAS	unmanned aircraft system
USAF	United States Air Force
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USD(I)	Under Secretary of Defense for Intelligence
USMC	United States Marine Corps
WIPT	Working Integrated Product Team
WSARA	Weapon Systems Acquisition Reform Act

References

Air Force Instruction (AFI) 10-601. 2013. Operations: Capability Requirements Development. Washington, D.C.: Secretary of the Air Force (November 6). http://static.e-publishing.af.mil/production/1/af_a3_5/publication/afi10-601/afi10-601.pdf

Air Force Instruction (AFI) 21-118. 2003. Improving Air and Space Equipment Reliability and Maintainability. Washington, D.C.: Secretary of the Air Force (October 2). http://static.e-publishing.af.mil/production/1/af_a4_7/publication/afi21-118/afi21-118.pdf

Air Force Instruction (AFI) 63-101/20-101. 2013. Integrated Life Cycle Management. Washington, D.C.: Secretary of the Air Force (March 7). http://static.e-publishing.af.mil/production/1/saf_aq/publication/afi63-101/afi63-101_20-101.pdf

Army Regulation AR 70-1. 2012. "Army Acquisition Policy." Washington, D.C.: Headquarters, Department of the Army (April 26). http://armypubs.army.mil/epubs/pdf/r70_1.pdf

Army Regulation AR 702-3. Forthcoming. "Army Materiel Systems Reliability, Availability, and Maintainability." Washington, D.C.: Headquarters, Department of the Army.

Carnevale, Anthony, and Bah Cheah. 2013. Hard Times: College Majors, Unemployment and Earnings. Georgetown University study. http://cew.georgetown.edu/unemployment2013/.

Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01H. 2012. "Joint Capabilities Integration and Development System." Washington, D.C.: Chairman of the Joint Chiefs of Staff (January 10). http://www.dtic.mil/cjcs_directives/cdata/unlimit/3170_01.pdf

Department of Defense Instruction (DoDI) 4140.67. 2013. "DoD Counterfeit Prevention Policy." Washington, D.C.: Under Secretary of Defense for Acquisition, Technology, and Logistics (April 26). http://www.dtic.mil/whs/directives/corres/pdf/414067p.pdf

Department of Defense Instruction (DoDI) 4245.14. 2012. "DoD Value Engineering (VE) Program." Washington, D.C.: Under Secretary of Defense for Acquisition, Technology, and Logistics (October 26). http://www.dtic.mil/whs/directives/corres/pdf/424514p.pdf

Department of Defense Instruction (DoDI) 5000.02 (Interim). 2013. "Operation of the Defense Acquisition System." Washington, D.C.: Under Secretary of Defense for Acquisition, Technology, and Logistics (November 26). http://www.acq.osd.mil/docs/DSD%205000.02_Memo+Doc.pdf

Department of Defense Instruction (DoDI) 5134.16. 2011. "Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE))." Washington, D.C.: Under Secretary of Defense for Acquisition, Technology, and Logistics (August 19). http://www.dtic.mil/whs/directives/corres/pdf/513416p.pdf

Department of Defense Instruction (DoDI) 5200.39. Forthcoming. "Critical Program Information (CPI) Identification and Protection Within Research, Development, and Acquisition (RDA) Programs." Washington, D.C.: USD(AT&L) and USD(I).

Department of Defense Instruction (DoDI) 5200.44. 2012. "Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)." Washington, D.C.: DoD Chief Information Officer/Under Secretary of Defense for Acquisition, Technology, and Logistics (November 5). http://www.dtic.mil/whs/directives/corres/pdf/520044p.pdf

Department of Defense (DoD) Open Systems Architecture Data Rights Team. 2013. "Better Buying Power: Understanding and Leveraging Data Rights in DoD Acquisitions." Washington, D.C.: DoD (June). https://acc.dau.mil/adl/en-US/436677/file/74605/BuyingPowerTrifold_June2013.pdf

Department of Defense (DoD) Open Systems Architecture Data Rights Team. 2013. DoD Open Systems Architecture Contract Guidebook for Program Managers. Version 1.1. Washington, D.C.: DoD (June). https://acc.dau.mil/interactiveosaguidebook

Department of the Navy (DON) Systems Engineering Stakeholders Group (SESG). Forthcoming. Naval Systems Engineering Guidebook. Washington, D.C.: DON SESG.

Department of the Navy (DON) Systems Engineering Stakeholders Group (SESG). Forthcoming. Naval System of Systems Engineering Guidebook. Washington, D.C.: DON SESG.

Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)). 2012. "Program Protection." Chapter 13 in *Defense Acquisition Guidebook* (DAG). Fort Belvoir, Va.: Defense Acquisition University. https://acc.dau.mil/dag13

Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)). 2013. "Systems Engineering." Chapter 4 in *Defense Acquisition Guidebook* (DAG). Fort Belvoir, Va.: Defense Acquisition University. https://acc.dau.mil/dag4

Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)). Forthcoming. Defense Acquisition Program Support (DAPS) Methodology. Version 3.0. Washington, D.C.: DASD(SE).

Government Accountability Office (GAO). 2013. Human Capital: Critical Skills and Competency Assessments Should Help Guide Department of Defense Civilian Workforce Decisions. GAO-13-188. http://www.gao.gov/products/GAO-13-188.

Harding, Kerry. 2000. "Understanding Emerging Workforce Trends." *Design Intelligence Update* http://www.di.net/articles/understanding-emerging-workforce-trends/

Hartley, Deanna. 2014. "2014 U.S. Job Forecast." *CareerBuilder.* http://careerbuildercommunications.com/pdf/careerbuilder2014_forecast.pdf

Manufacturing Readiness Levels (MRL) Deskbook V2.2.1. 2012. Washington, D.C.: OSD Manufacturing Technology Program in collaboration with the Joint Service/Industry MRL Working Group (October). http://www.dodmrl.com/MRL_Deskbook_V2_21.pdf

Meister, Jeanne. 2012. "Job Hopping Is the 'New Normal' for Millennials: Three Ways to Prevent a Human Resource Nightmare." *Forbes.* http://www.forbes.com/sites/jeannemeister/2012/08/14/job-hopping-is-the-new-normal-for-millennials-three-ways-to-prevent-a-human-resource-nightmare/.

National Research Council (NRC). 2012. Assuring the U.S. Department of Defense a Strong Science, Technology, Engineering, and Mathematics (STEM) Workforce. Washington, D.C.: The National Academies Press. http://www.nap.edu/catalog.php?record_id=13467.

Net Impact. 2012. Talent Report: What Workers Want in 2012. Full report prepared for Net Impact by the John J. Heldrich Center for Workforce Development at Rutgers, The State University of New Jersey. https://netimpact.org/docs/publications-docs/NetImpact_WhatWorkersWant2012.pdf.

President's Council of Advisors on Science and Technology. 2012. Report to the President. Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics. Report written for the Executive Office of the President. http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf.

Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics (PDUSD(AT&L)). 2011a. "Document Streamlining –Document Streamlining–Program Strategies and Systems Engineering Plan (SEP)." Memorandum (April 20). Washington, D.C.: PDUSD(AT&L). http://www.acq.osd.mil/se/docs/PDUSD-ATLMemo-Expected-Bus-Practice-TDS_AS_SEP-20Apr11.pdf http://www.acq.osd.mil/se/docs/PDUSD-Approved.SEP_Outline-04-20-2011.docx

Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics (PDUSD(AT&L)). 2011b. "Document Streamlining–Program Protection Plan (PPP)." Memorandum (July 18). Washington, D.C.: PDUSD(AT&L). http://www.acq.osd.mil/se/docs/PDUSD-ATLMemo-Expected-Bus-Practice-PPP-18Jul11.pdf http://www.acq.osd.mil/se/docs/PPP-Outline-and-Guidance-v1-July2011.pdf

Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics (PDUSD(AT&L)). 2011c. "Roles and Responsibilities of Office of the Secretary of Defense (OSD) Overarching Integrated Product Team Leaders (OIPT Leaders), Teams, and Team Members." Memorandum (July 19). Washington, D.C.: PDUSD(AT&L). http://bbp.dau.mil/doc/PDUSD-ATL%20Memo%2019Jul11%20-%20RandR%20of%20OIPT.pdf

Public Law 111-23, 111th Cong. (May 22, 2009.) Weapon Systems Acquisition Reform Act of 2009.

Secretary of Defense. 2013. "Safeguarding Unclassified Controlled Technical Information." Memorandum (October 10). Washington, D.C.: Secretary of Defense.

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2010a. "Better Buying Power: Mandate for Restoring Affordability and Productivity in Defense Spending." Memorandum (June 28). Washington, D.C.: USD(AT&L). http://www.acq.osd.mil/docs/USD(AT&L)_Memo_to_Acquisition_Professionals_June_28_2010.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2010b. "Government Performance of Critical Acquisition Functions." Memorandum (August 25). Washington, D.C.: USD(AT&L). https://acc.dau.mil/adl/en-US/392195/file/52955/USD%20AT_L%20Memo%20Government%20Performance%20of%20Critical%20Acquisition%20Functions%20(25%20Aug%2010).pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2011a. "Should-Cost and Affordability." Memorandum (August 24). Washington, D.C.: USD(AT&L). https://dap.dau.mil/policy/Lists/Policy%20Documents/Attachments/3301/ShouldCostAfford-24Aug11.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2011b. "Value Engineering and Obtaining Greater Efficiency and Productivity in Defense Spending." Memorandum (December 6). Washington, D.C.: USD(AT&L). https://acc.dau.mil/adl/en-US/488218/file/61837/VE%20and%20Efficiencies%20Memo_Signed%206Dec2011.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2012a. "Overarching DoD Counterfeit Prevention Guidance." Memorandum (March 16). Washington, D.C.: USD(AT&L). http://www.acq.osd.mil/log/sci/anti-counterfeit/Counterfeit-Prevention-Guidance.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2012b. "Guidance for the Continuation of Defense Acquisition Workforce Improvement Initiative." Memorandum (September 11). Washington, D.C.: USD(AT&L). https://dap.dau.mil/workforce/Documents/09-11-12%20ATL%20Guidance%20DAW%20Improvement%20Initiatives%20(USA005048-12_Signed).pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). 2012c. "Better Buying Power 2.0: Continuing the Pursuit for Greater Efficiency and Productivity in Defense Spending." Memorandum (November 13). Washington, D.C.: USD(AT&L). http://acquisition.navy.mil/content/view/full/9632

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Deputy Assistant Secretary of Defense
Systems Engineering
3030 Defense Pentagon
3C167
Washington, DC 20301-3030
www.acq.osd.mil/se